AMATEUR RADIO

OCTOBER 1993
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Journal of the Wireless Institute of Australia

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HOW TO BUILD —

A TRANSCEIVER FOR 80 METRES
A VOICE REPEATER CONTROL UNIT
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All contributions and correspondence concerning the content of *Amateur Radio* should be forwarded to:
Amateur Radio
PO Box 300
Caulfield South VIC 3162

REGISTERED OFFICE
3/105 Hawthorn Road
Caulfield North VIC 3161
Telephone: (03) 528 5962
Fax: (03) 523 8191
Business Hours: 9.30 am to 3 pm weekdays

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Amateur Radio Service

A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs, that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.

Wireless Institute of Australia

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Registered Federal office of the WIA:
3/105 Hawthorn Rd, Caulfield North, Vic 3161

All Mail to:
PO Box 300, Caulfield South, Vic 3162
Telephone: (03) 528 5962
Fax: (03) 523 8191

Business Hours: 9.30am to 3.00pm on weekdays

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Federal QSP

As I sit once again to put fingers to keyboard, we are between two of the more popular events on the amateur calendar. The Remembrance Day Contest has been and gone for another year. I was able to put in a very limited time to operating in this year's contest due to an interstate trip and other commitments on that weekend. However, in the limited time available, sufficient contacts were made to be able to put in an entry. By the time you read this, the deadline for submission of cover sheets to the contest co-ordinator will have passed so I hope that all who participated were able to get their sheets posted in time. Judging from what I observed in my limited time on air, the RD contest once again lived up to its name of the friendly contest. Participation is the key to a Division's winning the RD Contest Trophy. We must now all await the contest co-ordinator's decision to see which was the successful Division this year.

Participation is also the key to another event which comes up this month. I speak of JOTA, the Jamboree on the Air. To many this will have already caused groans and moans. It can be a trying time for both those who choose to assist as well as those who try to go about their normal operation on the JOTA weekend. There is something about trying to control a bunch of young people at the microphone. Young voices also sound so strange on the radio, largely because we are not accustomed to their presence.

But, all that aside, JOTA presents the amateur fraternity with an opportunity to expose more young people to amateur radio and, hopefully, convince them that life is not all about just computers and the latest game craze, but that there are other equally rewarding hobby pursuits. When you are approached by your local JOTA co-ordinator to assist in manning or setting up a JOTA station, think twice before declining. In these times of increasing pressure on the available RF spectrum, we need to make the most of every opportunity to attract others to our hobby. Like many such efforts, of the hundreds who will pass through and operate a JOTA station, only a very few will go on to pursue radio as a hobby, but each one helps.

We need to show to all those youngsters who do participate that amateur radio is something interesting. Many young people, and older people for that matter, tend to go silent when confronted with a microphone, so you need to do all you can to assist them to get over their mike shyness. If you are the operator assisting, have a cheat sheet ready of things to say and ask. If you are in contact with a JOTA station, do all you can to make it easy for those on the other end of the contact by remembering what your first contact was like and how you felt.

Some of this might sound like I'm beating the same old drum, but one of the things we all need to do is encourage others to take up this hobby. As many others more noteworthy than I have said about our bands, "Use them or lose them". That means being active ourselves as well as encouraging others to join us as amateur radio operators and also "using them".

Next month you will get a break from my words as I will be on holidays overseas and Neil Penfold VK6NE will be filling in for me.

Kevin Olds VK1OK
Federal President
ar

WIA News

Sexual Harassment by Radio, Man Fined

A Shepparton, Victoria, man found himself considerably poorer and minus a few transceivers after he was caught and charged over sexually harassing a woman over the air.

Adrian Lindsay Coyne of Shepparton was identified as making a number of sexually explicit and offensive remarks on a CB transceiver in September last year, the Shepparton Magistrate's Court was told in a hearing last April.

On the charge of harassment, Coyne was fined $500. He was also fined a total of $1000 on two counts for possession of unlicensed CB rigs. He had to forfeit the transceivers and pay court costs of $224.80.

Senior Technical Officer for the Department of Transport and Communications, Rodney Champness (VK3UG), said that the Department (now the SMA) would continue policing this type of offensive behaviour and that the fine should be a warning to others that anti-social behaviour on air would not be condoned.

WIA Divisions

The WIA consists of seven autonomous State Divisions. Each member of the WIA is a member of a Division, usually their residential State or Territory, and each Division looks after amateur radio affairs within their State.

Division	Address	Officers			Weekly News Broadcasts		1993 Fees
VK1	ACT Division GPO Box 600 Canberra ACT 2601 Phone (06) 247 7006	President Secretary Treasurer	Christopher Davis Hugh Blemings Don Hume	VK1DO VK1YYZ VK1DH	3.570 MHz LSB, 146.950 MHz FM, 438.525 MHz FM each Monday evening (except the fourth Monday) commencing at 8.00 pm. Repeated on Wednesday evening at 8.00 pm on 146.950 MHz FM.	(F) (G) (S) (X)	$70.00 $56.00 $42.00
VK2	NSW Division 109 Wigram Street Parramatta NSW (PO Box 1066 Parramatta 2124) Phone (02) 689 2417 Fax (02) 633 1525	President Secretary/ Treasurer (Office hours	Terry Ryeland Roger Harrison Mon-Fri 11.00-14.00 Wed 1900-2100)	VK2UX VK2ZTB	From VK2WI 1.845, 3.595, 7.146*, 10.125, 24,950, 28.320, 52.120, 52,525, 144.150, 147.000, 438.525, 1281.750 (*morning only) with relays to some of 14.160, 18.120, 21.170, 584.750 ATV sound. Many country regions relay via a local 2 metre repeater. Sunday 1000 and 1915. Highlights included in VK2AWX Newcastle Monday 1930 on 3.593 plus 10mx, 2mx, 70cm, 23cm. News headlines by phone (02) 552 5188. Some broadcast text can be found on the Packet network.	(F) (G) (S) (X)	$86.75 $63.40 $38.75
VK3	Victorian Division 40G Victory Boulevard Ashburton Vic 3147 Phone (03) 885 9261	President Secretary Treasurer Office hours	Jim Linton Barry Wilton Rob Hailey Tue & Thur 0830-1530	VK3PC VK3XV VK3XLV	1.840MHz AM, 3.615 SSB, 7.085 SSB, 53.900 FM(R) Mt Dandenong, 146.700 FM(R) Mt Dandenong, 146.800 FM(R) Mildura, 146.900 FM(R) Swan Hill, 147.225 FM(R) Mt Baw Baw, 147.250 FM(R) Mt Macedon, 438.075 FM(R) Mt St Leonard 1030 hrs on Sunday.	(F) (G) (S) (X)	$72.00 $56.00 $44.00
VK4	Queensland Division GPO Box 638 Brisbane QLD 4001 Phone (07) 284 9075	President Secretary Treasurer	Ross Marren Lance Bickford David Travis	VK4AMJ VK4ZAZ VK4ATR	1.825, 3.605, 7.118, 10.135, 14.342, 18.132, 21.175, 24.970, 28.400 MHz. 52.525 regional 2m repeaters and 1296.100 0900 hrs Sunday. Repeated on 3.605 & 147.150 MHz, 1930 Monday	(F) (G) (S) (X)	$70.00 $56.00 $42.00
VK5	South Australian Division 34 West Thebarton Road Thebarton SA 5031 (GPO Box 1234 Adelaide SA 5001) Phone (08) 352 3428	President Secretary Treasurer	Bob Allan Maurie Hooper Bill Wardrop	VK5BJA VK5EA VK5AWM	1820 kHz 3.550 MHz, 7.095, 14.175, 28.470, 53.100, 145.000 147.000 FM(R) Adelaide, 146.700 FM(R) Mid North,(146.900 FM(R) South East, ATV Ch 34 579.000 Adelaide, ATV 444.250 Mid North Barossa Valley 146.825, 438.425 (NT) 3.555m 146.5000, 0900 hrs Sunday	(F) (G) (S) (X)	$70.00 $56.00 $42.00
VK6	West Australian Division PO Box 10 West Perth WA 6872 Phone (09) 388 3888	President Secretary Treasurer	Cliff Bastin Bruce Hedland-Thomas	VK6LZ VK6OO	146.700 FM(R) Perth, at 0930 hrs Sunday, relayed on 3.560, 7.075, 14.115, 14.175, 21.185, 28.345, 50.150, 438.525 MHz. Country relays 3.582, 147.350(R) Busselton 146.900(R) Mt William (Bunbury) 147.225(R), 147.250(R) Mt Saddleback 146.725(R) Albany 146.825(R) Mt Barker broadcast repeated on 146.700 at 1900 hrs.	(F) (G) (S) (X)	$60.75 $48.60 $32.75
VK7	Tasmanian Division 148 Derwent Avenue Lindisfarne TAS 7015 Phone (002) 43 8435	President Secretary Treasurer	Andrew Dixon Ted Beard Peter King	VK7GL VK7EB VK7ZPK	146.700 MHz FM (VK7RHT) at 0930 hrs Sunday relayed on 147.000 (VK7RAA), 146.750 (VK7RNW), 3.570, 7.090, 14.130, 52.100, 144.100 (Hobart) Repeated Tues 3.590 at 1930 hrs	(F) (G) (S) (X)	$67.00 $53.65 $39.00
VK8	(Northern Territory is part of the VK5 Division and relays broadcasts from VK5 as shown received on 14 or 28 MHz).						

Note: All times are local. All frequencies MHz.

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Three-year membership available to *Australian resident* (F) (G) (X) grades at fee x 3 times.

"TCF" Sideband/CW Transceiver for 80 Metres

Drew Diamond, VK3XU describes an 80 metre transceiver for you to construct.*

"TCF" Transceiver.

Here are details of a relatively simple SSB/CW transceiver for the popular 80 metre band which may be built by the amateur without fancy test equipment. The availability of cheap computer grade crystals, and the utility of the NE602 balanced mixer/modulator IC, has made home construction of moderate performance receivers and transmitters much easier than in the recent past. Complexity and parts count has been kept to a minimum without sacrificing satisfactory performance. Transmitter and receiver sections have individual circuit boards, so these may be built as separate items (with small adaptions), or in stages, as desired. The prototype has the following measured characteristics:

Receiver

Frequency Range:	Nominally 3.5 to 3.9 MHz
Sensitivity:	0.5 μV for 10 dB S+N:N
Reception Modes:	SSB, CW, DSB and AM (as SSB)
Image Rejection:	70 dB
IF (6 MHz) Rejection:	60 dB
Incremental Tune (RIT):	Nominally +/−3.5 kHz
Frequency Stability:	Less than 100 Hz in any hour after warm-up

Transmitter

Frequency Range:	Same as receiver
Power Output:	At least 2 W, typically 4 W into 50 ohms
Modes:	SSB (LSB) and CW
Carrier Suppression:	35 dB
USB Suppression:	35 dB
Harmonics and Spurs:	At least −52 dB at full output
Frequency Stability:	Same as receiver
Load Tolerance:	Withstands any load SWR without damage
Power Supply:	Nominally +12 VDC at up to 1 A

Circuit

The receiver section is in the lower half of the schematic. The VFO and crystal oscillator, which are common to both the receiver and transmitter, are shown in the centre. Transmitter is in the top portion.

An IF of 6 MHz was chosen for several reasons; the crystals are cheap and widely available, the VFO frequency is a reasonable one (satisfactory stability is obtainable at 9 MHz without heroics), 6 MHz crystals can be pulled fairly easily, and no bothersome spurs are produced. 5 MHz must be avoided because of the possibility of IF breakthrough from the powerful VNG signals on that frequency. Complexity is avoided by using identical Twin Crystal Filters (TCF), one each for transmit and receive functions.

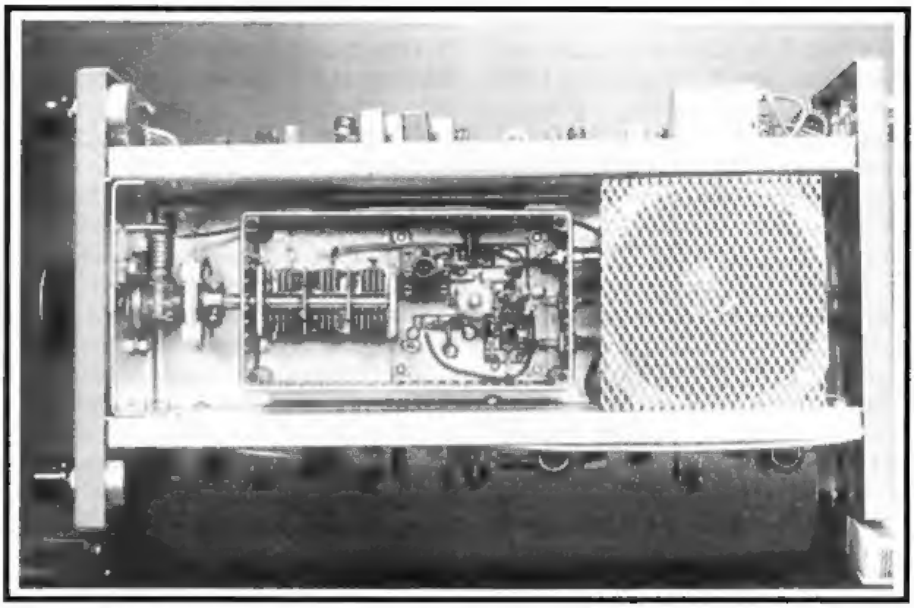
Receiving

Signals in the 3.5 to 3.9 MHz range are admitted via the top-coupled band pass filter, and applied to one of the NE602 inputs at pin 1 of the receive mixer. The VFO is adjustable from 9.5 to 9.9 MHz, and is injected into the oscillator port at pin 6. The wanted product (IF at 6 MHz) must negotiate the 4-crystal ladder filter. Bandwidth is determined by the value of the five coupling capacitors — 33 pF yields a bandwidth of about 1.8 kHz. The filtered 6 MHz signal is again presented to an NE602 as product detector. The crystal derived oscillator (BFO) signal of about 5.9998 MHz is applied to the oscillator port at pin 6. The 6.0 MHz oscillator crystal is pulled about 200 Hz low with a 10 μH coil to place it on the lower edge of the crystal filter bandpass, thus providing reception of LSB signals on SSB (the polarity of the sideband is reversed by the VFO mixing process), and single-signal reception of CW signals. The product of this action, low level AF, is applied to a conventional '741/'386 audio amplifier to power speaker or 'phones.

The NE602 was designed originally by Signetics for cellular radio applications, and has a 500 MHz input bandwidth. During breadboarding of this project it was found that TV and FM signals could enter the receiver (the transmitters are only a few km from here), mix with

the local oscillator VFO, and produce a few sub-microvolt spurs. A solution was simple; route the input receive signal via the transmitter's low-pass filter, which also improves IF rejection.

For CW operation, and to allow for small netting errors on SSB, incremental tuning is provided on receive with a diode and capacitor at the source tap of the VFO. The effective value of capacitance is altered by varying the forward current through the diode. A 470 ohm resistor is switched in on transmit to bias the diode to the same nominal current level as at the mid point of the 1 kohm offset pot, which is sourced on receive.



VFO and Dial Assembly.

Transmitting

Microphone audio is amplified and applied to pin 2 of an NE602 wired as a balanced modulator (input pins 1 and 2 are interchangeable, as are the output pins 4 and 5). "Carrier" at about 5.9998 MHz is applied to pin 6. The normally excellent balance is upset at audio rate, thereby producing double sideband (DSB) at the output of the balanced modulator. Static DC conditions of the '602 may be altered with high value resistors and a trimpot connected between pins 1 and 2, thus allowing for carrier balance adjustment. For CW operation, the '741 mike amplifier is unpowered, and balance is upset by inclining one side of the '602 input to ground. Rise/fall time constant is determined by the value of C at pin 1 — 1 μF — and series R — 22 kohm — resulting in click-free CW keying. Back-wave on CW is about the same as carrier suppression — −35 dB.

The DSB or CW signal emerging at pins 4 and 5 is applied to a second crystal filter, which passes the USB only, the LSB being greatly attenuated. Another '602 doing transmit mixing duty has VFO applied at the osc port where our 6 MHz SSB or CW signal is heterodyned as follows:- 9.5 — 6 = 3.5 MHz, 9.9 — 6 = 3.9 MHz. Once again, the VFO mixing process inverts the sideband polarity from USB to LSB, the convention for 80 m SSB.

The resulting SSB or CW signal is raised in discrete increments through a three stage linear amplifier to about 3 W. A seven pole low pass cleans up any harmonics which may be (and probably are) present at the drain of the output power MOSFET, and on reception also provides attenuation of all signals above about 5 MHz.

Construction

Equipment required: The usual electronics hand tools, drill-press (not essential), multimeter (preferably digital), power meter/load (or lamp), 80 m receiver, frequency counter and/or general coverage receiver.

The set must be housed in a metal box, so that external RF fields cannot enter and cause instability problems. My home made assembly measures 285 × 163 × 85 mm (11 × 6.5 × 3.5 inches approx). Good rigidity and compactness is obtained by using three internal sub-chassis panels as shown. Most components are accommodated upon three home-made circuit boards, which are receiver, VFO and transmitter. The first breadboard model was blobbed up "ugly" style on pieces of circuit board, which worked quite well. So we may assume that any of the current popular RF methods will work, provided that signal carrying wires and by-pass leads are kept reasonably short, and a circuit board ground plane is used. If only the receiver, or transmitter sections of this project are required, then it is only necessary to build that part, plus VFO and crystal oscillator (the crystal osc is located on the receiver board). As a transceiver project, I suggest that items should be constructed in the order of:- VFO, power supply (if required), receiver, then transmitter.

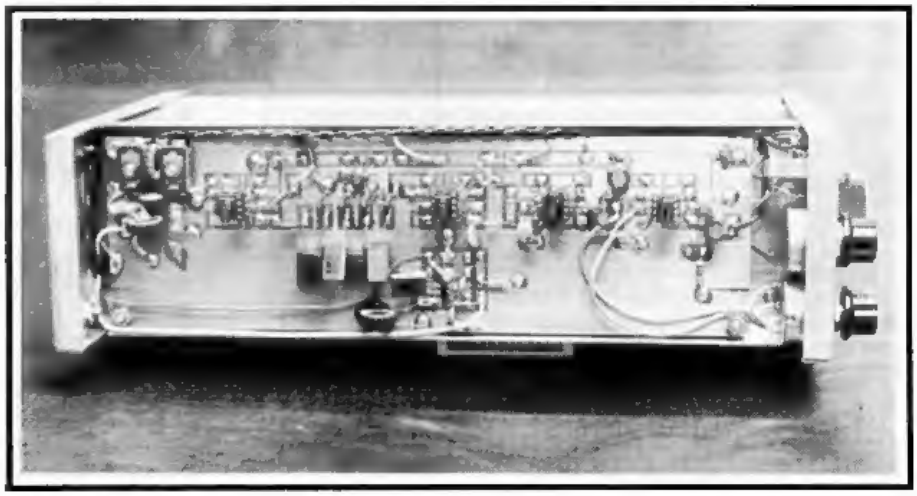
Constructors generally agree that a home-made VFO should be housed in a metal box, preferably die-cast. In addition to RF shielding, the thermal time constant of the box is so long that the oscillator tank is effectively buffered from any short term temperature excursions. A further useful degree of isolation may be had by mounting the box upon insulating material, or insulated spacers.

The VFO tank coil is wound on a standard 8 mm (5/16") former, the kind with four or six tags is ideal. Drill a 1 mm hole across the diameter of the former, 17 mm from the base. Uncoil about 1 m of 24 B&S wire from your spool, then fix the spool in a vice. Solder the wire to the tag corresponding to the ground end of the coil (check the circuit board layout). Whilst maintaining tension on the wire, walk towards the vice and wind on seven turns, then pull out sufficient wire to twist up a little pig-tail loop, which is the source tap. Now wind on the remaining 20.5 turns, making sure that each turn lies right next to the last, maintaining tension all the way. Cut the wire with about 50 mm spare, then carefully (this is the tricky part) poke the wire through the 1 mm hole, then pull through to keep tension on the coil. Solder the "hot" end of the coil to the appropriate tag. The coil should be coated with Q-Dope (TM), Estapol (TM) or shellac.

The variable capacitor shown is a 17/17/22 pF Alps unit available from some suppliers (see Parts). Only one gang, a 17 pF, is required. For a quality VFO, use the best constructed 15, 17 or 20 pF variable capacitor that you can find, NP0, polystyrene or silver mica capacitors in the VFO tank (avoid ordinary or unmarked ceramics for VFO applications), and an air dielectric trimmer. The components associated with RIT may be located on a small 5-tag strip soldered to the feed-through capacitor which carries RIT current into the VFO box.

The frequency dial consists of a disc of 3 mm opaque perspex, machined in a drill press using a tank-cutter. A hole-saw would also serve. Temporarily fix a bolt and nut through the resulting centre hole, and reduce the disc diameter by mounting it in the chuck and applying a flat file to the outer edge of the rotating disc. The clear perspex "window" has slightly larger diameter than the dial disc, and is fitted into the front panel. By the same method, but with the file tilted, put a slight taper on the outer diameter of the window disc so that it is a nice friction fit into the front panel. The planetary drive is mounted upon a right-angle formed in a sub chassis. To take up any small mis-alignment, the drive should be connected to the variable capacitor with an insulated flexible coupler. A short length of 6.35 mm (1/4") inside diameter rubber fuel hose clamped between drive and capacitor is a workable second best. The dial disc may be illuminated with a 12 V dial lamp placed so that light is radiated through a 10 mm hole from behind. A cursor line is formed by positioning a length of wire between lamp and dial, thus projecting a line onto the dial.

Power supply may be internal, or



Transmitter Board.

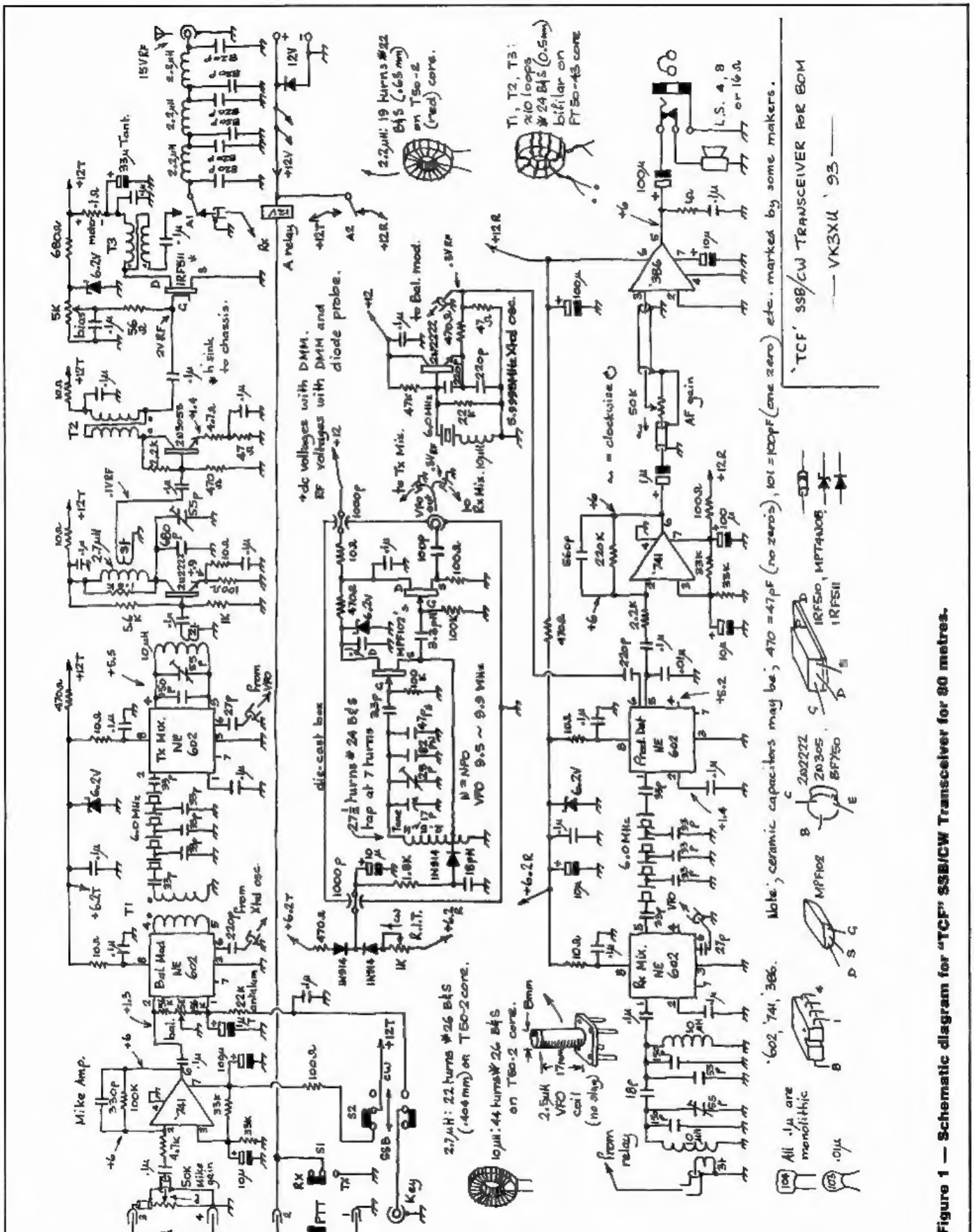


Figure 1 — Schematic diagram for "TCF" SSB/CW Transceiver for 80 metres.

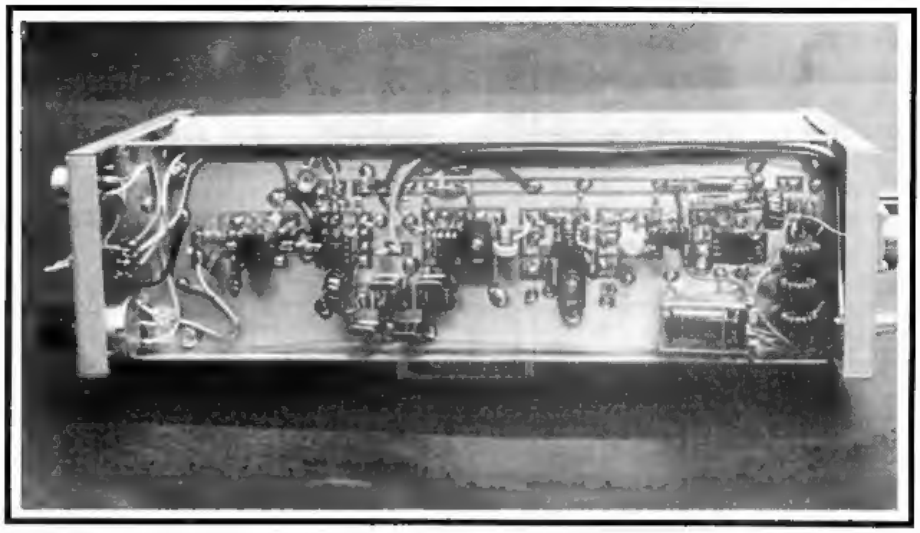
external to suit requirements. If accidental wrong polarity is possible (eg battery), connect a 1 A diode in reverse across the power input terminals, and series connect a 1 A fuse between positive battery supply and the set.

Bifilar broadband transformers T1, T2 and T3 are made as follows. Take two 300 mm lengths of 24 B&S wire, twist together at one end, and clamp that end in a vice. Twist the free ends together, and clamp in the chuck of a hand drill. Whilst maintaining tension, turn the drill until you have about three twists per cm, then pull the drill to set the pair. Now carefully loop the pair onto an Amidon FT50-42 core. About 10 loops should fit comfortably. Snip the ends leaving about 2 cm free. Remove about 1 cm enamel from each wire, and with a multimeter set on ohms, identify the "windings'. For T2 and T3, connect the end of one winding to the start of the other as shown on the circuit. Most toroidal transformers and coils are self-supporting. However, the 10 μH coils may be fixed to the board with a small blob of non acid silicone glue.

Several different brands of crystals were tried for the crystal filters and oscillator. The most satisfactory and reasonably priced were those branded QIC from Rod Irving Electronics. For best chance of success, it is strongly recommended that you use these also. Do not mix different makes of crystal in any one filter.

The IRF511 output amplifier must have an effective heatsink. A rectangular hole is cut in the circuit board so that the MOSFET may sink excess heat directly into the chassis. Remember to fit insulating hardware at the device/chassis interface. A solder tag under the mounting nut provides the drain connection. The source pin is soldered direct to the foil, then drain and gate pins are bent up at right angles to clear the board.

Although it is handy to have an in-built ammeter to monitor the PA drain current, meters are rather expensive, and once the standing current bias has been set up, there is rarely need to touch it again. The current drawn by the remaining circuitry (excluding dial lamp) is insignificant. So, if the power supply is external, and has its own meter, then none is required for the transceiver. In the absence of a metered supply, a 0.1 ohm resistor in series with the drain supply line allows us to connect a multimeter across it and check the current. 150 mA will therefore cause 0.015 V to be dropped, 900 mA drops 0.09 V, and so on. Most DMM's will easily read these values.



Receiver/Crystal Oscillator Board.

Alignment

Receiver: The VFO range must first be defined. If a counter is available, simply connect the VFO to the counter input and measure the frequency. Adjust the 25 pF VFO trim capacitor so that a range of less than 9.5 MHz to over 9.9 MHz is generated. Check that the RIT pot gives a smooth receive frequency adjustment of about 3.5 kHz each side of mid pot travel. If for some reason, the correct range cannot be obtained, change one of the VFO NP0 tank capacitors, larger or smaller as required.

No counter? Listen for the VFO signal on a general coverage receiver and adjust as described above. A short clip lead inserted in the VFO output connector should radiate a detectable signal. Adjust frequency and check stability with the VFO cover in place. With the perspex window removed, the dial may be calibrated by applying rub-on numbers at (say) 100 kHz increments.

Connect an antenna to the input. Peak the two 55 pF trim capacitors at the receiver input filter for best sensitivity/flatness across the band. The receiver should be responsive. At moderate loudness, SSB and CW signals should sound clean, without perceptible distortion or hum.

Transmitter: Set the MOSFET bias pot for minimum voltage, and the VFO to 9.6 MHz (to produce 3.6 MHz). Connect the output to a 50 ohm dummy load (a 12 V 5 W auto lamp will do). Disconnect any dial lamp if you are doing your current measurement with a power supply ammeter. Select CW mode, and switch to send. Adjust the MOSFET bias voltage for about 150 or 200 mA of standing (no signal, or "idling") drain current. Close the Morse key. Current should increase. Adjust the 55 pF trim capacitors at Tx Mix and the collector tank of the 2N2222 amplifier for maximum RF output. Current should now be about 900 mA, giving about 2 to 4 W RF output across the band. Open the key. Whilst listening to the signal on another receiver, adjust the "bal mod" pot for carrier null. You should obtain a clearly defined null as the carrier is balanced out. The signal at the test receiver must not be so strong that the null is masked. CW keying should sound crisp and be free of clicks and chirps.

Plug in a radio type PTT dynamic microphone. Whilst talking, increase the mike gain pot until the drain current flicks up to about 900 mA on voice peaks. Listen to the SSB signal on another receiver (don headphones to avoid feedback). It should sound

clean, and be free of splatter, clicks, hum, or other unpleasant noises. If an oscilloscope is available, view the RF waveform. It should have nicely rounded peaks, without bright spots anywhere on the envelope, and no significant "carrier" with mike gain at minimum.

Set the RIT pot to mid travel. On transmit, measure, as precisely as you can (preferably with a DMM), the voltage at the junction of the two 1N914s. Now switch to receive. Adjust the RIT pot to read exactly the same voltage, then slacken off the RIT knob grub screw and position the pointer to a calibration mark at 12 o'clock. Transmit and receive frequencies will now be the same at the nominal mid point of the RIT pot.

In actual use, when contact has been established with another station, any necessary receive frequency adjustments must be made with the RIT pot — leave the main VFO control untouched. When operating CW, about 1 kHz RIT offset will be necessary to obtain a pleasing "beat note".

An After-burner

Three watts with a full-size dipole has yielded good interstate and ZL SSB and CW contacts at night, although the going has sometimes been rough under noisy conditions. The output power may be boosted with a linear amplifier. One similar to the 25 W job described in Reference 6 is suggested, with the addition of a relay with two sets of change-over contacts to by-pass the amplifier during receive.

Parts

All conventional components are available from the usual electronics suppliers. The crystals were purchased from Rod Irving Electronics (03) 543 7877. In addition, radio type components may be ordered from Stewart Electronics (03) 543 3733, Truscotts Electronic World (03) 723 3860, and Electronic Disposals (03) 723 2699. These firms will answer mail orders. VFO capacitor, pots, Amidon cores and trim caps were purchased from the latter two vendors. Amidon suppliers also advertise in the Hamads of this journal. Perspex and printed circuit board may be obtained from electrical insulation merchants (eg O H O'Brien, South Melbourne). The planetary reduction drive came from Dick Smiths.

More Information

Some relevant DC and RF voltages are shown on the circuit to aid in any necessary troubleshooting. Voltages which differ greatly should indicate the problem area. If, after earnest efforts, you cannot get your project to work satisfactorily, or require more information, including circuit board "artwork" and component location diagrams, please write to me at the address above, and all reasonable assistance will be gladly returned. An appropriately sized SASE would be appreciated.

References and Further Reading

1. NE602 Primer — Carr, Elektor Electronics, Jan '92.
2. Sideband Can Be Simple! — Price G4BWE, RadCom, Sep '91.
3. A Miniature SSB Transceiver — Grierson G3TSO, RadCom, June/July '91.
4. QRP SSB/CW Transceiver for 14 MHz — Hayward W7ZOI, QST, Jan '90.
5. Designing and Building Simple Crystal Filters — Hayward, QST, July '87.
6. 25 W MOSFET Linear Amplifier — Diamond VK3XU, AR Jan '91.
7. Some Practical Tips on VFO Construction — Diamond, AR Jan '88.

Parts List for the "TCF" Transceiver

Capacitors all 16 V or greater	Qty
3.3 pF NP0	2
18 pF NP0	2
17 pF variable (see text)	1
25 pF "beehive" air trimmer	1
27 pF NP0	2
33 pF NP0	10
47 pF NP0	1
55 pF compression mica trimmer	4
150 pF polystyrene	3
220 pF polystyrene or ceramic	4
330 pF ceramic	1
560 pF ceramic	1
820 pF polystyrene (avoid ceramic)	6
1000 pF feedthrough	2
0.01 µF ceramic	1
0.1 µF monolithic	28
1 µF electrolytic	1
1 µF tantalum	1
10 µF electrolytic	5
33 µF tantalum	1
100 µF electrolytic	4
Resistors all 1/4 or 1/2 W	
0.1 ohm	1
1 ohm	1
4.7 ohm	1
10 ohm	8
47 ohm	2
56 ohm	1
100 ohm	4
470 ohm	5
680 ohm	1
1 kohm	1
1 kohm linear pot	1
1.5 kohm	1
2.2 kohm	2
4.7 kohm	1
5 kohm flat mount trimpot	2
5.6 kohm	1
33 kohm	4
47 kohm	1
50 kohm log or linear pot	2
56 kohm	2
100 kohm	3
220 kohm	1

Semiconductors	
MPF102, 2N5457, etc.	2
2N2222, 2N3904, etc.	2
2N3053, BFY50, etc.	1
IRF510, IRF511, MTP4N08 etc.	1
NE602AN	4
LM741	2
LM386	1
6.2 V 400 mW zener	4
1N4148 or 1N914 diode	3

Miscellaneous

Case to suit, or sheet aluminium to make, die cast box 120 × 65 × 36 mm, Amidon T50-2 cores (8), FT50-43 cores (3), QIC brand 6.0 MHz crystal (9, all identical), 6 or 4-pin 8 mm bakelite coil former, dial drive, coupler, perspex, 12 V lamp & holder, 8-pin DIL wire wrap sockets (7), single or double-sided circuit board material, speaker, mike socket, antenna coax connector, phones socket, key socket, RCA plug and socket for VFO, power supply terminals, knobs, 12 V relay with two sets of c/o contacts, miniature SPST and DPDT switches (one each), miniature 50 ohm coax, chassis items including IRF511 mounting hardware, screws, nuts, washers, and VFO spacers

"Nar Melan" Gatters Road, Wonga Park, VIC 3115

ar

Voice Repeater Control Unit

*R S Graham VK4BRG * describes a comprehensive Repeater Interface Controller.*

This unit consists of a CW ident generator, associated nine minute timer and a timeout timer. It has been designed to fit into and interface to a Philips FM-828 transceiver, mentioned previously in another role in AR for April 1993, page 21.

These radios seem to be the most popular of all for amateur repeaters. However, the design could well be adapted to suit other types of radios. The electronic design that follows is quite standard..the prime purpose of the article is to present a suitable design, EPROM programming details and a suitable layout, all in the one article. Thus other repeater builders have something to duplicate with a minimum of time and effort.

At the time of writing this article, it would appear that the DOTC requirement regarding repeater identification may be relaxed. Nevertheless, some repeater builders, in consultation with users, may well decide that it would still be a good idea to have a CW ident on their repeater. Others may choose to use just the time out section, the ident. timer, modify the design etc. The keying section is also suitable for keying a beacon. In this application, it could be expanded by programming additional EPROM data line(s) to, for example, change the beacon power level, switch antennas etc. There is a lot of space left in the EPROM!

The unit is built on vero-board and consists of four sections:-

a) CW ident section.
b) Ident timer..nine minutes... (adjustable).
c) Time out timer .four minutes... (adjustable).
d) Interconnecting logic.

My suggestion is to build and test the various sections in that order.

The CW ident section uses U2 (555 timer) to generate the clock signal for U3. The 50k preset adjusts the clock frequency and thus the CW speed. When pin 11 (reset) of U3 (4040 ripple counter) is low, the U3 outputs sequentially scan the first seven address lines of U4, a 2716 EPROM.

Three EPROM data lines are used:-

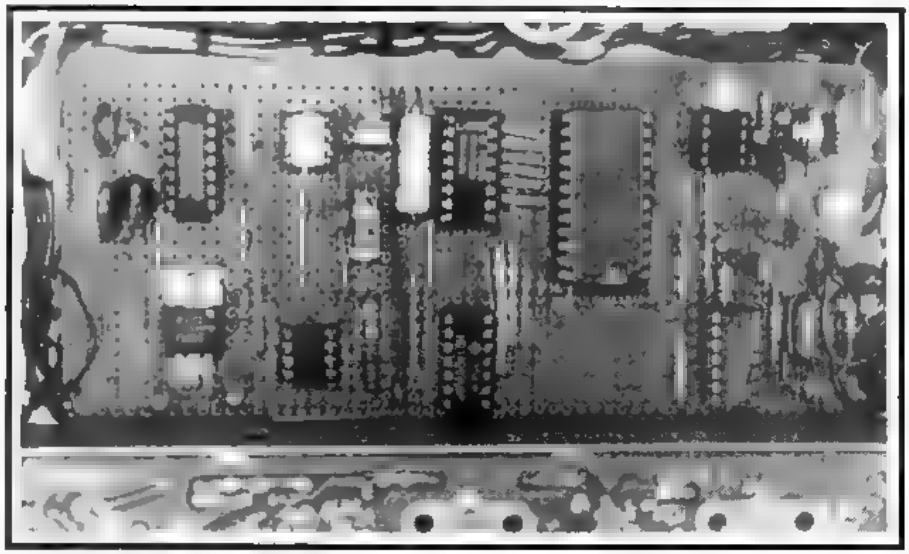
a) D0 (pin 9) for the actual CW keying.
b) D1 (pin 10) to hold the TX keying on for the duration of a keying cycle. This is necessary if a user just momentarily keys the repeater. The TX is then held on for a complete keying cycle.
c) D2 (pin 11) provides a reset pulse at the end of a keying cycle.

The keying signal (D0) enables U5 (a 555 in the astable mode) which generates the keyed audio. Its frequency is determined by the resistor/capacitor combination on pins 2, 6 and 7. This is, of course a square wave, but the 56k resistor/.022 μF capacitor combination in the output circuit modifies this to an approximate sine wave output. The 1K resistor prevents loading of the radio audio circuit when the output level preset pot is near minimum. D1 enables the transmit keying line via a 2N2222 transistor (T1). The reset pulse (D2) is used, via inverter (U8c), to reset the nine minute timer (U1).

Both the timers (U1 and U9), use a 4541 timer IC in similar circuits. These chips are not expensive, and have the advantage of providing long timing periods with small value capacitors. Matrix board pins are used at these capacitor locations so that smaller value capacitors (.0027 μF) may be initially installed This procedure is recommended for initial testing, giving a timing period of around 50 seconds with the presets at mid-range. One is then not wasting so much time in waiting for the timers. Another time saver, that I used in similar situations, is to temporarily wire a LED and a series resistor (470 ohm) from pin 8 of each timer to ground. One can then visually see the timers states during the testing period. The .0027 μF capacitors are replaced with the correct values near the end of the testing period.

U7 (555 timer) is used to control the 4040 reset line. Pin 2 of U7 is normally high and senses the receiver mute line which goes low on receive. When this occurs, and provided the chip is not "held off" by pin 4 being held low (when U1 is timing), pin 3 of the 555 goes high, which, via the inverter U8(d) resets the 4040. Should the receive mute be open at the conclusion of a U1 timing cycle, as it would be during extended repeater operation, the 4040 is immediately reset, and thus a keying cycle is recommenced after each nine minutes of repeater operation.

The receive timeout timer (U9) is reset each time the receive mute opens. The output of that timer, (pin 8), which is high during the timing cycle, switches the second 2N2222



Voice Repeater Control Unit showing the Veroboard construction.

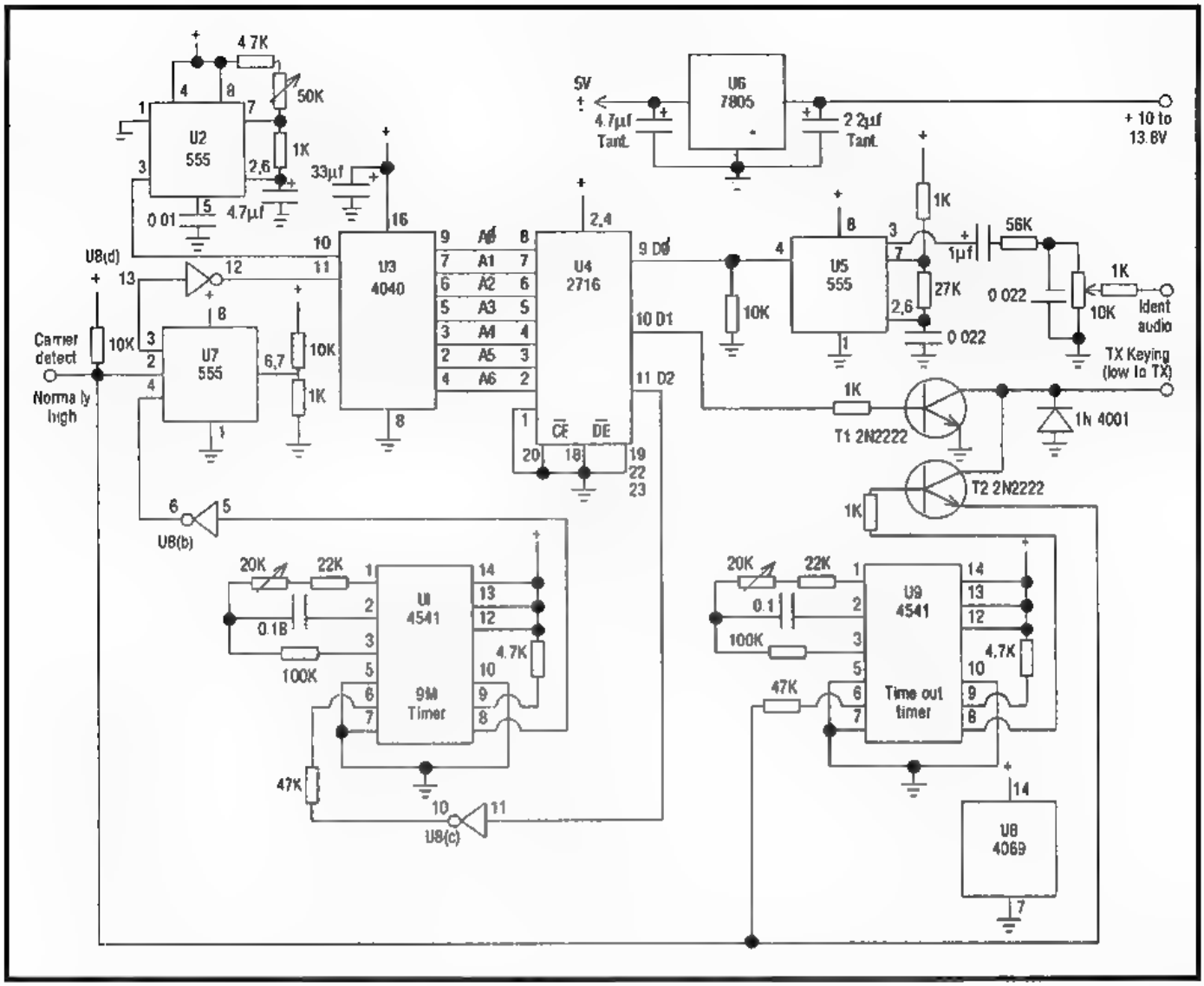


Figure 1 — Schematic Diagram of the VK4BRG Voice Repeater Control Unit.

transistor (T2) on and completes the TX on circuit from the receive mute line.

So it can be seen that the TX is on under the following conditions:-

a) In order to complete a keying cycle, via T1 (2N2222)
b) Should the receive mute be open AND the timeout timer period not be expired.

The unit is powered from the output of a 5 volt regulator. I used a 7805 one amp unit, but the 100 mA 78L05 would be more suitable. With the FM-828 radio, I ran this control unit from the 10 volt rail. Of course, a 13.8 volt supply point would be equally suitable.

Acknowledgments to Will, VK4XP, who provided me with an initial electrical design, plus some necessary inspiration. Also to Dave, VK4UN, for burning the EPROM and to Stan, VK4BZO, for the photograph.

* PO Box 323, Sarina Qld 4737

BT

A 40 Watt Switched Mode Power Supply

K W Gooley VK5BGZ presents an informative and ingenious constructional article.*

WARNING FROM THE EDITOR

This project SHOULD NOT be attempted by persons unqualified to obtain the RELEVANT ELECTRICAL CERTIFICATION applicable in their State, which is issued by their local Electrical Authority.

Switch Mode Power Supplies operate on the MAINS ELECTRICITY SUPPLY. Do NOT work on these power supplies without external isolation.

A separate low voltage power supply should be used for testing circuitry around the control chip. A variable transformer on the mains inlet to the Switch Mode Supply is essential when testing. Always test at low voltages first.

Remember, the case of the Switch transistor (OR FET) will be at MAINS POTENTIAL, as will their heat sinks.

Operational Switch Mode Power Supplies should always be enclosed in a protective container.

Always use a safety shield when working on these power supplies and NEVER fiddle with mains electricity; it is lethal.

Switched Mode Power Supplies. UGH!! Is that your reaction to the subject? Complicated things, generating lots of radio, TV etc interference; to be kept at arm's length as much as possible? Well, that was my attitude a few years ago but it has been changed firstly by repairing a couple; one powered an Apple II computer as I recall. Then I decided that these types of power supplies were going to be used more and more in electronic equipment so I'd better come to grips with the technology. After reading a few articles on the subject and parts of a book or two I designed my first off-line SMPS and it's not that hard. Now several power supplies later, I designed the SMPS that is about to be described, a 13.8 volt 3 Amp unit used to power a 10 watt 2 metre FM transceiver. It's small and efficient, needing no large finned heat-sink. The aluminium case is sufficient, **AND** it generates no TV, radio or other interference.

Before we go on to describe the unit's design and construction, some general background on the subject of switched mode power supplies may assist readers.

There are many types of switching supplies, each having its own characteristics and intended purpose. The simplest to understand if not to build, is perhaps the switching regulator where a low output voltage is required from a much higher one. The input voltage may be generated with a conventional transformer, rectifier, filter-capacitor combination. This type of regulator has been used in various laboratory supplies requiring a wide range of output voltage with high efficiency (it is known as the "buck regulator"). A series switch transistor is turned on and off with a duty cycle dependent on the difference between input and output voltage. A filter choke and capacitor smooth the output. A commutation diode is used to maintain continuous current flow in the choke while the series switch is off (figure 2).

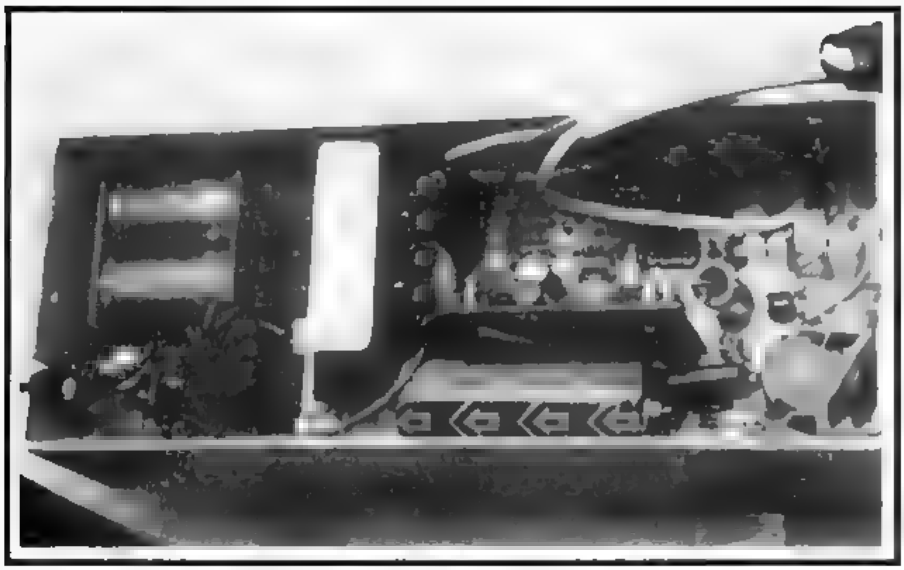
By rearranging the positions of the 4 basic components as shown in figure 3, voltages higher than the input can be obtained; the so-called boost regulator. If the output of the buck regulator is grounded and the commutation diode used to switch the energy stored in the choke into a storage capacitor, negative output voltages can be generated (figure 4).

If isolation between input and output is required a secondary winding can be coupled to the choke making a transformer. But it may or may not function as a conventional transformer. Lower powered SMPSs < 50 to 200 W are usually of the flyback type where energy is stored in the "primary" during the switch ON period and transferred to the secondary circuit during the OFF period. In this situation, the transformer doesn't operate as a conventional transformer in that current does not flow simultaneously in primary and secondary windings. It is sometimes referred to as a coupled choke to emphasise the difference in operation. The operation of flyback types of supplies may be discontinuous where current flow in the secondary ceases before the end of the OFF period, or continuous where secondary current flow continues to the end of the OFF period and not all the energy stored in the primary is transferred to the filter capacitor. The discontinuous type of flyback power supply is also known as a ringing choke converter and is widely used for small DC-DC converters.

If power outputs greater than about 100 to 200 Watts are required, it is generally preferable to use the forward configuration of supply because flyback transformers become excessively large. More power throughput for a given transformer size can be obtained from one of the forward mode configurations. In a forward supply, current flows in the primary and secondary simultaneously as in a true transformer rather than alternately as in the flyback coupled choke.

Design

Now to this particular power supply The basic architecture of an off-line SMPS is shown in figure 5 . A bridge rectifier and filter capacitor produce 340 volts DC directly from the 240 volt AC mains. A MOSFET, when switched on, applies the DC to the coupled choke primary and current starts to rise in a linear ramp. The rate of rise is di/dt = V/Lp. Where Lp is the primary inductance and V the applied voltage, approximately 340 volts. With the particular control IC used, a UC3843, the end of this ON period may be brought about in one



Internal view of the 40 watt Switch Mode Power Supply.

of three ways. Firstly, the feedback loop from the output voltage will tell the controller that sufficient energy has been stored in the choke primary and the switch should turn off. This is the usual reason that the controller IC ends the ON cycle. However, if the power supply is overloaded and the MOSFET switch source current exceeds a certain value, in this case about 1.5 Amps, the control chip ends the ON period to protect the switch.

The third mechanism which can end the ON period is a limit that is placed on the duty cycle by the designer's selection of the resistor in the oscillator section of the controller. The IC data sheet includes a graph of timing resistor value against duty cycle. With the resistor selected in this design 10 k, the maximum duty cycle is 95%. An extra margin of safety could be incorporated by reducing this value to say 1 k where the maximum duty cycle would be reduced to about 50%. Of course to maintain the same oscillator frequency the timing capacitor C14 would have to be increased to 47n.

When the MOSFET switches off, the voltage across the primary reverses with the drain voltage rising to well above the 340 volt supply. At this point the secondary diode conducts and the energy stored in the primary is dumped into the filter capacitor replacing charge that flowed to the load during the OFF period.

The main task in designing a power supply such as this is the design of the power transformer or coupled choke. Firstly, the power throughput is calculated:

Output voltage = 13.8 volts
Output current = 3 amps
Expected overall efficiency = 75%
Therefore input power
P_{in} = 13.8 x 3 x 1/0.75 = 56 watts

The next step is to select an operating frequency, 40 kHz in this case. This is a reasonable compromise between lower frequencies where the transformer is larger, and higher ones where suitable components are less easily available. The available FETs, controller ICs and diodes will cope with much higher frequencies but ferrite core losses increase with the 1.2 power of frequency and ferrites suitable for power conversion at frequencies of 200 kHz to 1 MHz are not as readily available as those for lower frequencies. So 40 kHz it is. This means that the period of oscillation (T) is 25 μsecs.

Next we select the full load duty cycle (η) of the MOSFET switch. This selection is based on the facts that the smaller we make it, the bigger the choke core must be for the required power output while an upper limit is placed on duty cycle by the time required to transfer all the energy to the filter from the choke core during the OFF period. The maximum duty cycle was selected as 35% as a reasonable compromise, one that is used commonly in published designs.

With the duty cycle selected we can easily deduce the full load ON time of the switch

$t_{on} = T \times \eta = 25 \times 0.35 = 8.75 \mu seconds$

Since the power throughput is 56 watts we know that each cycle the energy stored in the core is :-

$P_i \times T = 56 \times 25 \times 10^{-6} = 1.4$ mjoules.

This is the energy stored as current flow in the inductance of the choke primary at the end of the ON period and is defined by the equation:

$$W = 1/2\, L_p\, i^2_{max} = P_i \times T = 1.4 \text{ mJ} \quad \ldots\ldots\ldots (1)$$

Where L_p is the primary inductance and i_{max} is the MOSFET drain current just prior to turn-off.

We also know that the rate of rise of current in an inductor is given by the equation:-

$$\frac{di}{dt} = \frac{V_{DC}}{L_p} \quad \text{where } V_{DC} = 340 \text{ volts}$$

The current rises linearly from 0 to i_{max} during the ON period of 8.75 μsec. Therefore:-

$$\frac{di}{dt} = \frac{i_{max}}{t_{on}}$$

Equating these 2 expressions for di/dt, we get:-

$$I_{max} = \frac{V_{DC} \times t_{on}}{L_p} \quad \ldots\ldots\ldots (2)$$

Substituting for i_{max} in equation (1) we obtain an expression for L_p

$$L_p = \frac{2 \times P_i \times T \times L_p^2}{V_{DC}^2 \times t_{on}^2}$$

Rearranging:-

$$L_p = \frac{V_{DC}^2 \times t_{on}^2}{2 \times P_i \times T}$$

Since we know all these parameters, we deduce that the required primary inductance is 2.64 mH. Substituting this value into equation (2) we find that I_{max} is 1.03 Amps.

The next task is to select the core type and size. The EC series of ferrite cores are convenient to use as they are composed of 2 E shaped sections which allows for good heat removal due to the open construction of the resulting transformer In addition the centre leg is circular making winding the turns on the bobbin easier. Charts shown in data sheets on the ferrites

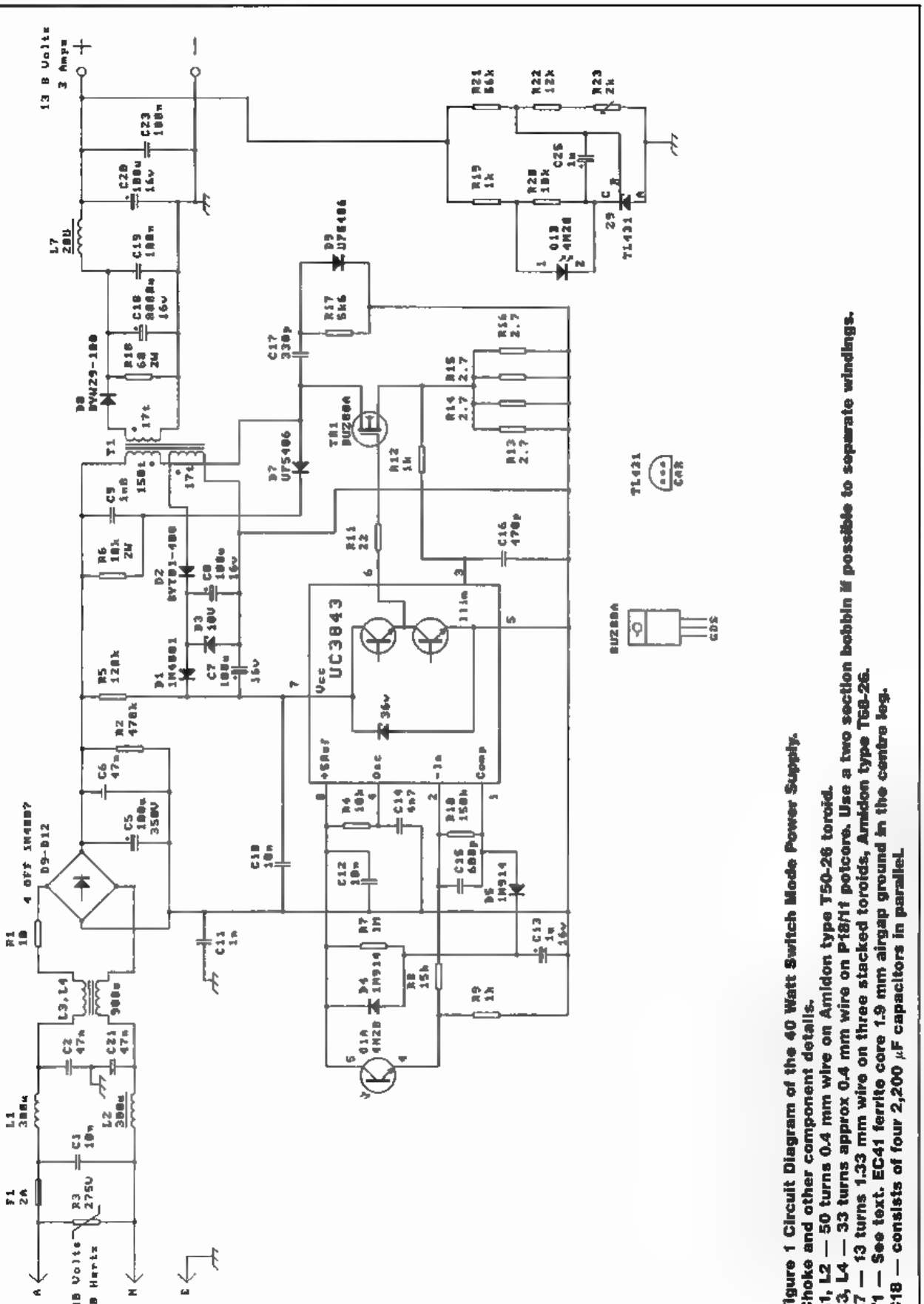


Figure 1 Circuit Diagram of the 40 Watt Switch Mode Power Supply.
Choke and other component details.
L1, L2 — 50 turns 0.4 mm wire on Amidon type T50-26 toroid.
L3, L4 — 33 turns approx 0.4 mm wire on P18/11 potcore. Use a two section bobbin if possible to separate windings.
L7 — 13 turns 1.33 mm wire on three stacked toroids, Amidon type T68-26.
T1 — See text. EC41 ferrite core 1.9 mm airgap ground in the centre leg.
C18 — consists of four 2,200 µF capacitors in parallel.

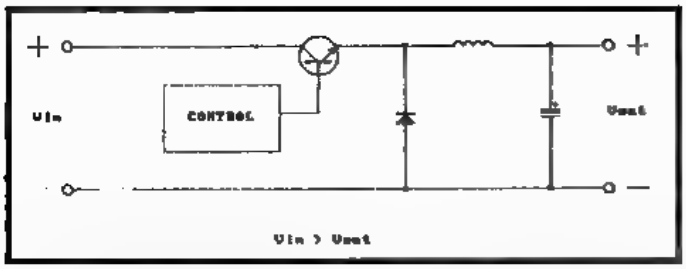


Figure 2 Buck Regulator.

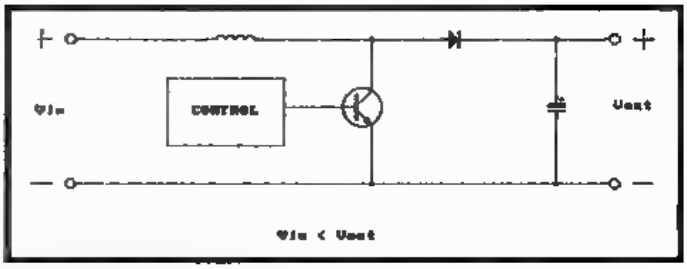


Figure 3 Boost Regulator.

give a guide to the size selection for a given power level and frequency. I chose a type EC41 as this size is more than adequate and I wanted a good margin of safety in terms of temperature rise and also plenty of room in the winding space for good insulation. If one were designing a transformer for large scale production a smaller core could be chosen for this power level and frequency and more care taken with winding and the selection and placement of insulation. As it is there is plenty of room for winding and insulation.

We must now work out an appropriate number of primary turns and the size of air-gap to prevent the core saturating at the maximum primary current. An excellent article in recent ARRL Amateur Radio Handbooks describes a 13 volt 22 Amp flyback SMPS. This article gives the following equation linking primary turns, (N_p), flux density, (B_{max}), inductance and core cross sectional area.

$$N_p = \frac{I_{max} \times L_p}{B_{max} \times A_e}$$

We know i_{max} (1.03 Amps), L_p (2.64 mH). B_{max} is selected as 150 milli-Teslas, well below the nominal saturation flux density given by ferrite manufacturers as 300 mT. Not all readers will be familiar with this MKS unit of flux density.

1 T = 1 Weber per m^2 = 104 gauss.

A_e is the effective core cross-sectional area (m^2) and is given in the core data sheet as 121 mm^2 (1.21 x 10^{-4} m^2).

Putting all these values into the equation, we get N_p = 150 turns; not too much trouble to wind by hand. The air gap must be chosen to give the calculated inductance with the calculated number of turns. The Magnetic Components Data Book from Neosid Australia Pty. Ltd. gives good information on this subject. The following formula for the length of the airgap is given:-

$$l_{gap} = K \times l_e \left(\frac{0.4\pi \ N_p^2}{L_p \sum \frac{l}{A}} - \frac{1}{\mu_i} \right)$$

l_e is the effective length of the magnetic path, given in the core data sheet as 89.3 mm. N_p and L_p we have already calculated (150 turns and 2.64mH). $\Sigma l/A$ is a physical parameter of the core related to its shape and is given in the data sheet as 0.735 mm^{-1} The factor k is included to take account of the fringing effects around the edge of the gap and unfortunately it is dependent on the length of the gap which is of course the unknown in the equation. However, for a gap of 1 mm k = 1.4 and for 2 mm k = 1.5. Thus the gap can be calculated as 1.9 mm. Alternatively the gap could be found by experiment. The inductance of the completed winding is measured and the air-gap adjusted until the calculated value is obtained.

Having determined the number of primary turns, the number of secondary turns can be calculated. As this is a coupled choke and not a true transformer, the turns ratio does not conform to the conventional transformer equation:-

$$\frac{N_p}{N_s} = \frac{V_p}{V_s}$$

We must put in a "fiddle factor" k. We won't go into the theory too far in this article but restrict ourselves to the practical. k varies in published designs from about 0.25 to 0.5 and for this design I chose 0.375. Hence secondary turns:-

$$N_s = N_p \times \frac{V_s}{V_p} \times \frac{1}{k}$$

$$= 150 \times \frac{13.8}{340} \times \frac{1}{0.375}$$

$$= 17 \ turns$$

An extra secondary is put on the transformer to supply the small amount of power required for the control circuit. The number of turns is chosen to be the same as the main secondary giving a nominal 14 volts across the filter capacitor C8. It would be inefficient to use the 340 volts DC with a dropping resistor as several watts would have to be dissipated in the resistor. A high value resistor R5 provides the power to get the circuit started (pull itself up by its bootstraps) and once sufficient voltage is available from the rectifier D2 and filter capacitor C8, the bulk of the drive power comes from this source.

The selection of main switching device is made with the knowledge of the peak current, 1.03 Amps plus a safety margin and a voltage rating governed by the peak voltage across the device when in the OFF condition. Neglecting leakage inductance effects, the maximum drain voltage in the OFF state is:-

$$V_p = V_{DC} + \frac{N_p}{N_s} \times V_o$$

$$= 340 + \frac{150}{17} \times 14.8$$

$$= 470 \ volts$$

Leakage inductance effects cause a spike on the front edge of the drain voltage pulse so an adequate safety margin needs to be included The chosen device is rated at 800 volts and 3 amps.

The main output rectifier carries a peak current of 3 x $1/\eta$ where η is the duty cycle = 0.35. This comes to 8.57 Amps peak. Consideration must be given to the peak inverse voltage rating of this diode because when TR1 is on, the voltage across the diode is:-

$$V_{diode} = V_{DC} \times \frac{N_s}{N_p} + V_o$$

$$= 340 \times \frac{17}{150} + 13.8$$

$$= 52 \ volts.$$

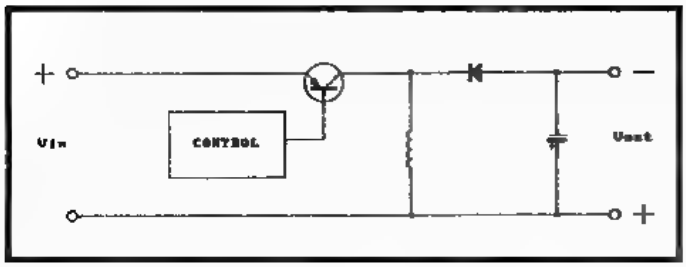


Figure 4 Voltage Inverting Regulator.

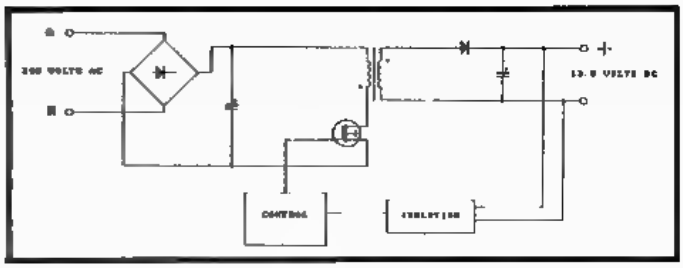


Figure 5 Off-Line Flyback SMPS.

The device selected has a 100 volt 8 Amps average rating.

The other component in this section worthy of consideration is the main filter capacitor C18. This is selected on the basis of ripple current rating. The full load current flows into and out of the capacitor each cycle and it must be capable of carrying this current without over-heating. 2.2 millifarad (mF) 16 volt electrolytics have a current rating of the order of 1 amp depending on the type and manufacturer. Four of these are used in parallel to give an overall RMS ripple current rating of 4 amps.

The Control Circuit

Control of the power supply operation is largely in the hands of the UC3843 IC. This neat little 8 pin device contains a 5 volt reference, an oscillator, an op amp, comparator and an output stage capable of peak currents of 1 amp. It is ideal for driving MOS power devices. The oscillator frequency and maximum duty cycle are determined by R4 and C14. The op amp and comparator modulate the oscillator duty cycle such that a fall in output voltage causes the MOSFET switch ON time to be lengthened, increasing the energy supplied to the load restoring the output voltage.

The feed back control works in the following way. Z9 is an adjustable voltage reference which attempts to maintain a voltage of 2.5 volts between its control terminal and anode by varying the current flow from cathode to anode. The voltage divider R21, R22, and R23 sets the voltage at the control terminal of Z9. With the values given, an adjustment of output voltage of about 0.5 volts is available.

If the output voltage falls, the cathode current of Z9 rises turning on the optocoupler LED further which causes the phototransistor to conduct more current. The consequent rise in voltage across R9 causes the op amp and comparator to lengthen the TR1 ON period, increasing the output voltage. Conversely a rise in output voltage causes the cathode current of Z9 to fall and the consequent falling voltage across R9 shortens the TR1 ON period reducing the output voltage.

The ratio of R8 to R10 determines the feedback loop gain and the loop stability is enhanced by C15 and C25. A "soft start" feature is provided which allows time for things to settle down after the mains power is applied before the MOSFET switch TR1 is first switched on. This is accomplished by R7, C13, D4 and D5. C13 serves to hold the voltage on pin 1 of the IC low for about 300 msecs preventing the output from switching on.

Current overload protection of TR1 is implemented by sampling the source current through the 4 paralleled resistors R13 to R16. If the voltage across these resistors exceeds 1 volt, the control IC switches the MOSFET off. R12 and C16 prevent short transients (< 0.5 μsec) triggering the current protection.

EMI

Electromagnetic interference (EMI) considerations are taken care of by a 2 section filter in the mains circuit. A pair of chokes L1 and L2 on separate iron powder toroids reduce interference appearing on the active with respect to the neutral and vice versa (differential mode) and a 2 winding choke L3 and L4 on a pot core reduces common mode interference appearing on both active and neutral with respect to earth. The 2 windings must of course be well insulated from each other and in the prototype a 2 section bobbin was used. The EMI suppression capacitors C1, C2 and C21 must be rated for 240 volt AC mains operation.

The DC output is filtered with a π section filter with both large value electrolytics and 100 nF ceramic capacitors to filter both high and low frequency interference components. The choke must carry the DC load current and again iron powder toroids are used. It will be observed in the photographs of the unit that the positive output lead of the power supply is wound around another toroid. This choke is not shown in the circuit diagram and was included as a precautionary afterthought not because the unit generated any EMI.

There are some components which have not yet been mentioned and which deserve to be. These are the diode R-C networks associated with the drain of the MOSFET switch. Energy stored in the transformer leakage inductance during the ON period of TR1 is not transferred to the secondary but must be absorbed on the primary side one way or another. Efficiency considerations demand that this energy be kept as low as possible as it is wasted. Leakage inductance is kept low by sandwiching the secondary winding between the 2 halves of the primary.

If the diode R-C networks are not included, the energy would result in a voltage spike on the drain of TR1 of sufficient amplitude to destroy the MOSFET. The energy is therefore shunted away via D7 to C9 and dissipated in R6 which must be rated at 2 watts or so in this design. C9 should be rated at 600 volts or more. A network similar to C17, R17 and D9 is included in many off-line flyback power supplies and I included it as extra protection for the MOSFET.

Construction

Detailed construction information will not be given here as I do not expect other constructors to duplicate my unit exactly. However, figure 6 is included to illustrate the layout used. The demonstrator power supply was assembled on single sided blank fibreglass laminate with the components placed on the foil side and wiring on the reverse. A strip of copper about 5 mm wide was removed from the board separating the mains side from the output circuitry. The transformer straddles the gap in the ground plane. The bulk of the foil on the mains side is connected to the negative common of the 340 volts DC, while the output side foil is connected to the negative side of the 13.8 volts output which is also connected to the metal case and mains earth. There are 2 small isolated areas of foil in the corners of the mains end of the board through which mounting screw holes are drilled. Capacitor C11 connects between the mains end ground plane and one of these mounting screws.

Winding the transformer should be done with great care and attention to the polarisation of the windings. If all the windings are wound in the same direction, the dots on the circuit diagram indicate the start of each winding. The primary winding is wound with 0.5 mm wire and is wound in 2 sections of 75 turns each with the 2 secondary windings sandwiched between the 2 halves of the primary. The main secondary is composed of 7 strands (twisted) of the same wire as that used for the primary making a 7 × 0.5 mm Litz wire. 17 turns nicely occupy one layer on the EC41 bobbin. When designing such transformers it is necessary to give thought to how the turns will fit on the bobbin when making final decisions about the actual number of turns and the size of wire to be used. The 75 turns of each half of the primary completely occupy a full 2 layers.

Generous insulation should be placed between primary and secondary windings. I used "Empire Cloth" a woven material of ancient vintage. PVC tape could be used provided the transformer interior temperature does not exceed 70°C which is very doubtful at full load with this design. High temperature tape is available from some electronics suppliers. PTFE thread-sealing tape could be used as well.

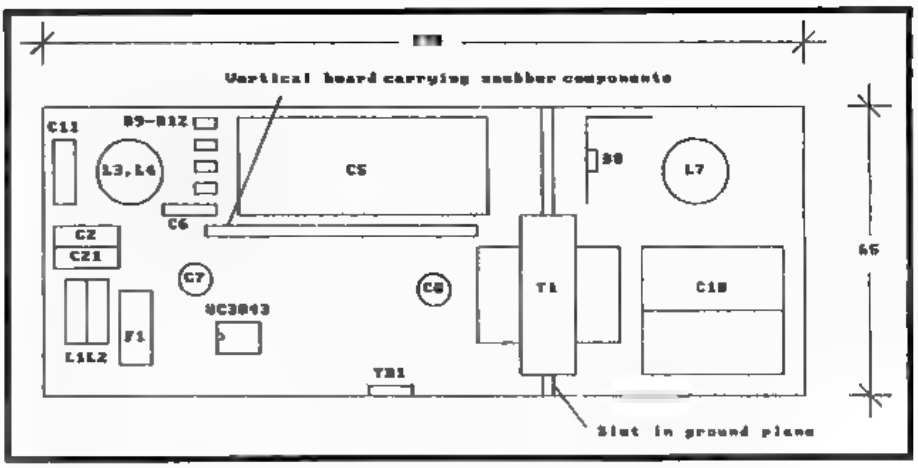


Figure 6 Layout Showing Major Components.

The air-gap, whether calculated or derived by experiment can be inserted in the magnetic path by placing pieces of insulating material of suitable thickness between the halves of the core. Alternatively, the centre leg of one of the core halves can be carefully ground on a bench grinder until the correct gap is obtained. Using this method invariably results in some chipping of the ferrite around the edge but as long as the chips are not too big, no harm will result. The important point is that the primary inductance is somewhere near the calculated value.

Heatsinking requirements for this supply are not great due to the high efficiency. The MOSFET is mounted on the inside of the case which is fabricated from 2.5 mm aluminium sheet. The drain of the MOSFET is connected to the mounting tab and care should be taken that sufficient insulation is placed between it and the case to withstand the 600 volts or so. I used a single silicone rubber heatsink pad. A 50 x 25 mm piece of 2.5 mm aluminium suffices for a heatsink for the output rectifier diode.

The snubber components associated with the drain of the MOSFET were mounted on a separate piece of fibreglass board mounted vertically on the main board. This was done to conserve space as these components are larger than the majority of minor components in the power supply.

Conclusion

Well there it is, a flyback off-line SMPS of modest output contained in a case of compact dimensions. As indicated earlier, it is not intended that the design be constructed on a wide scale but rather the information given be used to engender a wider appreciation of SMPSs and also that the more experienced amateur constructor be able to design and build similar power supplies to his/her own requirements.

Torr-Crest Tanafeate Court, One Tree Hill SA 5114

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Coaxial Cable Traps — In Search Of The Perfect Antenna

Paul Duff VK2GUT describes how to build superior coaxial traps.*

Ever hear the one about the amateur who pulled down all his antennas and never got around to putting them up again? About two years ago I got fed up with trying to get out on 80 metres with a dipole 20 feet off the ground and no decent earth. A change of QTH seemed the perfect chance to look at my options, especially as the new site, a small semi in the suburbs, had very little ground space. What I really wanted was an antenna which was easily built, easily mounted and demounted, easily matched, had broad multiband function and an omnidirectional pattern of radiation. It also had to be portable.

See why I never got back on the air?

Last year, however, I got my full call and, fired with enthusiasm, I tackled the problem afresh. A multi trapped vertical, chimney mounted and fed with open wire line via a transmatch, such as the Z Match, seemed to fill most of my criteria except for the broadband response and ease of construction. Every design that I came across seemed to be a mass of high voltage capacitors, difficult to tune coils and hard to shape phenolic spacers. That was when I came across the idea of using coaxial cable in traps.

Theory

The most basic coaxial cable trap uses the coaxial cable as a capacitor, see Fig 1. This is simple but cumbersome and offers no great advantage over a standard trap.

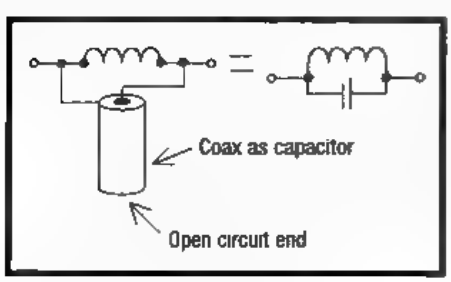


Fig 1 Basic coax trap.

The idea of using the coaxial cable as both coil and capacitor first appeared in QST in May 1981, see Fig 2. The shield acts as the coil. The inner conductor, because each turn is shielded from the next, has no more inductance than a straight wire of the same length but the coaxial cable still maintains its inherent capacitance. The result is a much more elegant trap but electrically it has little more to offer than the simple trap. The electrical equivalent is shown in Fig 2.

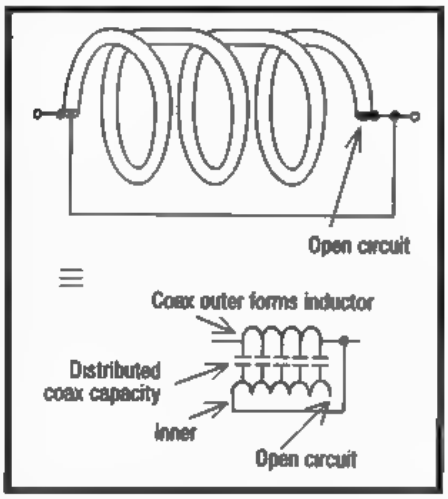


Fig 2 Coax also forms coil.

In Ham Radio for October 1981, Gary O'Neill N3GO described a coax trap, Fig 3, which looked the same but, in fact, was very different. This I have tried to represent in the circuit diagram. In this trap the shield and the inner conductor are magnetically linked and the current thus induced means that this circuit has much more inductance than that in Fig 2. This current, however, changes the whole phase arrangement of the capacitive element which also consists of the shield and the inner conductor. The result is that the capacitance decreases in direct proportion to the increase in inductance. If the coupling is perfect, which it nearly is, the inductance is increased by four and the capacitance is decreased by four but the resonant frequency stays the same (Ref QST August 1985).

Photo 1 Side view of 14.2 MHz trap.

To follow why these traps are superior you may refer to the equations in Table 1.

$$Z = \frac{-J(Xo)}{(F/Fo) - (Fo/F)} \quad \text{EQN 1}$$

$$Xo = 2\pi FoL \quad \text{EQN 2}$$

$$L = \frac{(D+t)^2 n^2}{18(D+t)+40nt} \quad \text{EQN 3}$$

$$C = \frac{Co\pi n(D+t)}{12} \quad \text{EQN 4}$$

$$Fo = \frac{1000}{2\pi\sqrt{LC}} \text{ MHz} \quad \text{EQN 5}$$

All lengths in inches (with apologies) as sourced from US articles and books.

Xo = reactance at resonance of either the inductor or capacitor
L = inductance
C = capacitance (total)
Co = capacitance fo coaxial cable per foot
F = operating frequency
Fo = resonant frequency
Z = tuned circuit impedence
n = number of turns (assume close wound)
t = thickness of the coax with insulation on
D = inner diameter of the coil

Table 1 Parameter equations.

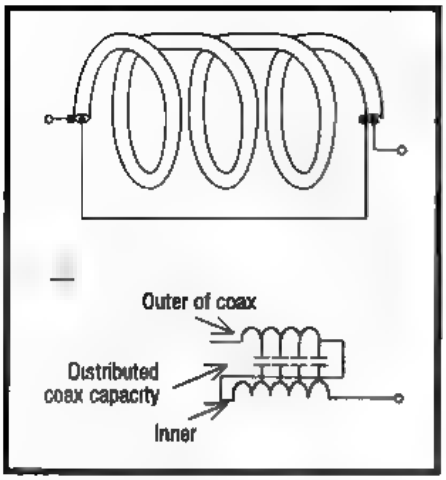


Fig 3 Inner plus outer in series.

The perfect trap would give 100% isolation across the band of interest and 100% conduction outside that band. An adequate trap, being one which will give an SWR less than 2:1 across the band, must provide at least 7 kΩ of isolation at the band edges. This band edge impedance is directly proportional to the reactance at resonance of either the coil or the capacitor. See Eqn 1 in Table 1. This is in turn directly related to the inductance. See Eqn 2 in Table 1. But below 30 MHz the losses from a trap are all from the coil. If these losses are represented as a resistor in parallel with the trap then a lossless trap will have infinite resistance and a lossy trap will have a low resistance.

Now look at the graph in Fig 4. Quite obviously the best trap is the one with the largest R and the largest L. Also notice that the trap impedance at resonance is equal to the value of R. I have already shown that the N3GO trap has a big inductance for its design. What O'Neil has also shown experimentally is that his trap has a high value of impedance at resonance in spite of this large inductance. What we have then is a trap with good bandwidth which is relatively loss free, is cheap and easy to construct and is power rated into the kilowatt range.

Design

Again refer to Table 1. If you can synthesise equations 3, 4, and 5 to give a value for n for a given value of L, Co, D, Fo, and t then you are better at mathematics than I am. For those of you like me, a simpler answer is to

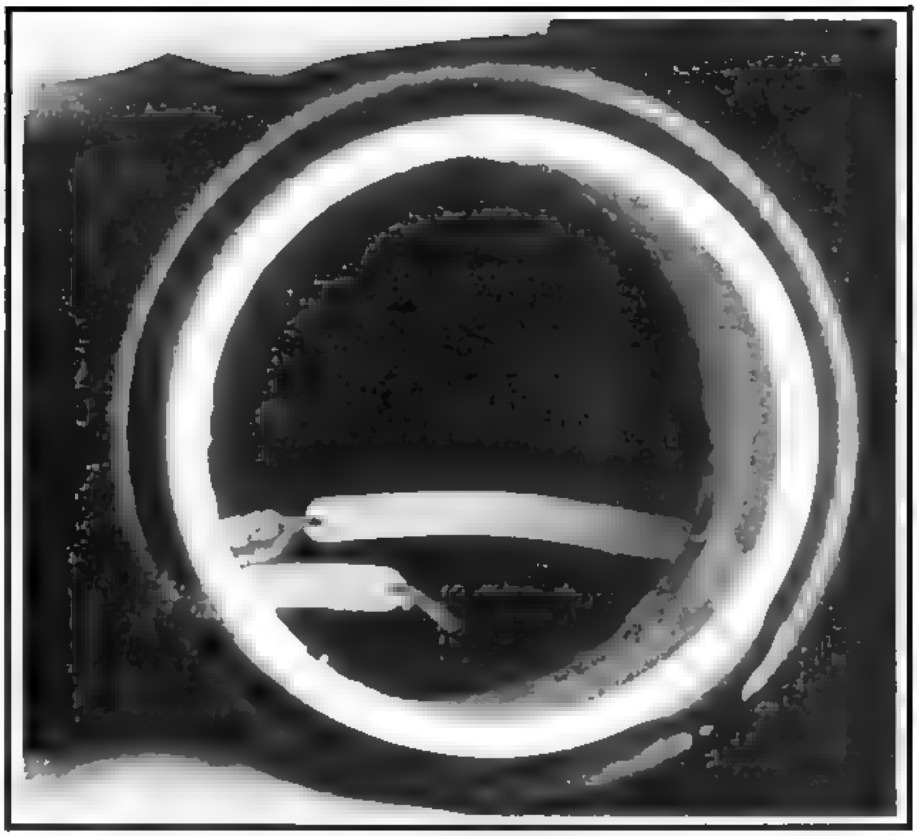


Photo 2 End view of 14.2 MHz trap.

program your computer to substitute for values of n using a for/next loop until a given value of f is reached. In writing such a program two points should be noted. The first is that D+t is used as the coil diameter rather than D+2t so as to give the mean coil diameter and this works well. The second is that a value of D should be chosen to provide the shortest length of coax possible in the coil as this will reduce losses to their minimum. This occurs when the denominators in equation 3 are equal. That is, when (D+t)/nt = 2.22. In reality any value between 2.5 and 1.0 provides an acceptable coax length (Ref QST Dec 1984). A Basic program for the C64 is given in Table 2. This should be adaptable to other computers. A set of optimised trap dimensions is given in Table 3.

Construction

Construction is easy if you just follow the steps below.

1. Choose a former of suitable diameter white PVC pipe and cut a short length.

Table 2

C64 BASIC Program to Calculate Trap Dimensions

```
10  PRINT "FORMER DIAMETER" :ENTER D
20  PRINT "COAX THICKNESS IN INCHES" .ENTER T
30  PRINT "COAX CAPACITANCE IN pF PER FOOT" :ENTER Co
40   PRINT "DESIRED FREQUENCY IN MHz" :ENTER \X
100 FOR N=1-500step0.25
200 L=((D=T)EXP2*nEXP2)/(18*(D*T)=(40*n*t)
300 C=Co*3.142*n*(D=t)/12
400 f=1000/2*3.142*(sqr(D=t))
500 IF f<=X THEN GO TO 700
600 NEXT n
700 PRINT "NUMBER OF TURNS EQUALS " :N
800 PRINT "COAX LENGTH EQUALS " :N*(D+t)/2.54:"mm"
900 END
```

Table 3

Dimensions of optimised traps using RG58C/U coax and commonly available PVC formers.

Frequency (MHz)	Former ID	Former OD	Turns Tight Wound (n)
3.6	70 mm	75 mm	10.2
7.1	60	64	6.8
14.2	40	44	5.5
21.5	32	36	4.75
28.8	32	36	3.75

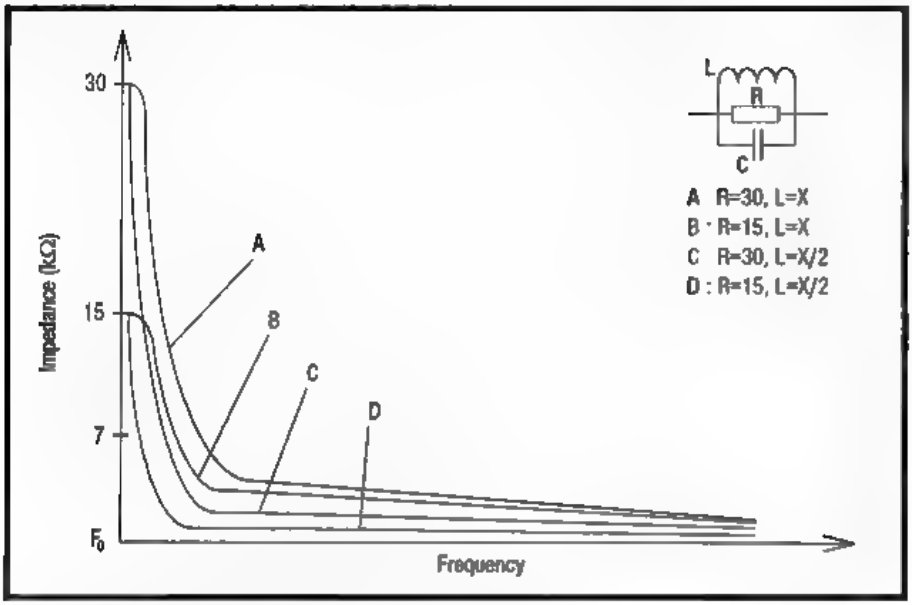


Fig 4 Relative impedance bandwidths.

2. Drill a hole for the coax near one end of the former.
3. Cut a piece of coax 6 cm longer than the calculated length needed for the coil. Strip 3 cm of cover from each end.
4. Insert one end of the stripped coax into the drilled hole on the former. Tightly coil the insulated length of coax around the former
5. Mark the point on the former where the coax insulation finishes. Do not worry too much if this does not exactly correlate with your calculated value of n.
6. Remove the coax and drill a second hole at the marked spot.
7. Separate the exposed braid and conductor back to the insulation. Strip and trim the inner conductor as necessary and then rewind the coax trap. Finally solder the braid at one end to the conductor at the other.

The result should dip very closely to the required frequency but if any fine tuning is required this can be done by slightly separating the turns of the coil before applying glue to fix them in place. The photographs show a trap for 14.2 MHz.

Conclusion

The potential uses of such a simple device are endless. My own plans are to build a top loaded vertical for 80 through 10 metres for under $60. Multiband dipoles not requiring an ATU, dual or triband beams or simple dual or triband mobile use would be easy to build. Experiments with miniature coax may extend their use to VHF at least at low power. I can see these traps being the basis of antenna projects for years to come.

218 Ocean Beach Rd Woy Woy NSW 2256

Remember to leave a three second break between overs when using a repeater.

WIA News

Canadian Convention

The first national convention of the Radio Amateurs of Canada (RAC) has been scheduled for 29-31 July 1994, to be held in Calgary, Alberta.

A feature of the convention is to be a technical symposium, and the RAC has issued a call for papers. Topics being considered include HF, VHF, UHF, plus operating modes such as RTTY, AMTOR and packet, along with space activities like AMSAT and moonbounce.

If you're interested in giving a paper, submit a proposal by 15 October; first draft of papers will be due by 1 March 1994.

Information from G W Shand VE6BLI, 55-51551 Range Road 212A, Sherwood Park AB T8B 1B2. (From the ARRL Newsletter).

EQUIPMENT REVIEW
Yaesu FRG-100 HF Communications Receiver

Ron Fisher VK3OM investigates the latest receiver from Yaesu.*

It seems that most amateur equipment manufacturers base their communications receiver design on an existing transceiver. Yaesu have always been different in this respect and have produced receivers that fit into a particular market niche. To go back to the beginning, the original FRG-7 was a runaway favourite in the low cost field. Rumour has it that the idea behind the FRG-7 was suggested to Yaesu by an Australian distributor when the South African Barlow failed to produce an updated version of the XCR-30, the receiver that set new standards in low cost performance in the early 1970s. While the XCR-30 worked well, it didn't look like a communications receiver. The FRG-7 looked right and worked well, particularly on SSB. The FRG-7000 followed with the added feature of a digital readout plus better selectivity for SSB. The FRG-7700 followed with updated design. The thirty bands 1 MHz wide were switch selected and no front end tuning was required. Yaesu also offered several popular accessories including a VHF converter and an antenna tuning unit. The FRG-7700 is an excellent choice on the secondhand market.

The FRG-8800 brought Yaesu receivers into the fully synthesised age. Now with continuous tuning right through the HF spectrum and of course a generous supply of memories. I am not sure if Yaesu intend to continue production of the FRG-8800 or whether the new FRG-100 will take over.

If I had been asked a few months ago to give an opinion on what a new Yaesu receiver would look like, I would have predicted that it would resemble the FT-890 amateur transceiver, but not so. The FRG-100 is a brand new design aimed at the lower price end of the professional style receiver range.

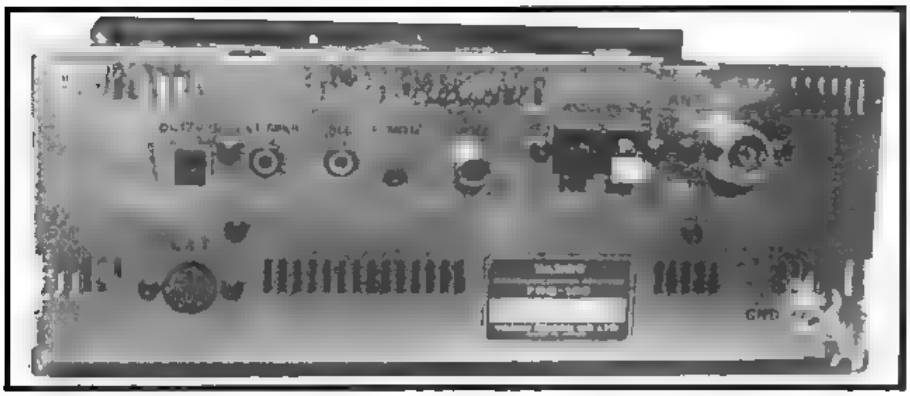
So, what is the FRG-100? What does it do and how well does it do it? The FRG-100 has full coverage from 50 kHz to 30 MHz. It receives AM, USB, LSB, CW and, as an option, FM. Three filters are included as standard, a 2.7 kHz for SSB, and 4 and 7 kHz for AM. CW reception uses the SSB filter but Yaesu offer a 500 Hz filter for improved reception as an optional extra. A large and clear LCD displays the frequency readout, memory channel selection and most of the status indicators. The most surprising feature of the FRG-100 is that it does not incorporate a power supply. The receiver requires 12 to 14 volts at about 1.5 amps. There is also no provision for battery operation and, with the 1.5 amp drain, you would need a bit more than a stack of torch batteries to keep it going for any length of time. A rather flimsy DC cord is supplied with the receiver. Yaesu do produce a wall type power supply to suit but with Dick Smith's current practice of not importing power supplies it seems unlikely we will see this here. The next surprise is the size. I had seen photos of the receiver before seeing the real thing but that didn't prepare me for the diminutive size of the FRG-100. The overall size is 238 mm wide, 93 mm high and 243 mm deep. Weight is 3 kg. A carry handle is provided on the right hand side of the cabinet.

Controls on the receiver have been simplified with rotary controls provided for tuning, volume, squelch and memory selection. All functions are selected via twenty four push buttons and these include power on/off, front end attenuator, noise blanker, AGC fast/slow selection, four mode selection buttons, memory selection, VFO memory change over, clock setting and frequency band up/down selection.

In addition to this, many functions are selectable or can be changed to suit the operator by holding down certain buttons while turning on the power switch. The main tuning control is about 40 mm in diameter and while it is weighted, it lacks a good fly wheel effect. It does have a convenient finger hole which is a big help in spinning up and down the bands.

The FRG-100 On The Air

Overall, the receiver was a delight to use. The tuning rate on SSB and CW is 5 kHz per knob revolution and 50 kHz per revolution with AM reception Both of these can be speeded up by ten times by pushing the "Fast" button. Band changing is via the Up/Down buttons to the right of the tuning control. This is normally in 100 kHz segments but again by selecting the "Fast" function this steps up to one MHz segments. The receiver is programmed to switch rapidly between the various short wave broadcast bands via the Up/Down buttons. This is enabled by holding the "Set" button then the



Rear panel view of the Yaesu FRG-100.

"Up" button. Now with "Fast" selected the Up/Down buttons will step in sequence the 15 broadcast bands. This includes the standard broadcast band and the European long wave band. Unfortunately, no similar system is provided to step between the various amateur bands.

The FRG-100 uses direct digital synthesis which gives very clean tuning. If you have been used to an older synthesised receiver, this will be very apparent when tuning AM signals. There is a distinct lack of clicks and plops and the tuning sounds as smooth and clean as your 1950s valve receiver!

AM performance was especially good with the choice of wide and narrow selectivity. Both of these have been well optimised. Many receivers switch to the SSB filter in the narrow position which is too narrow. AM audio quality was quite good but, as our tests show, the distortion is too high at high percentage modulation. While this will not worry many owners, a reduction of distortion down to one or two percent could make a substantial difference to AM reception. SSB reception was excellent. The product detector has low distortion and the slightly wider than normal bandwidth gives better than average audio quality. The inbuilt speaker gives acceptable audio quality, but connecting my normal station speaker made a very marked difference.

Two antenna input connectors are provided on the rear panel. An SO-239 for 50 ohm input and a pair of terminals for high (450 ohm) impedance input. A switch located on the rear panel between the two connectors allows switching between them. This allows two antennas to be connected to the receiver at the same time, say a dipole for short wave reception and a long wire for broadcast and general reception. Unfortunately, the switch is a miniature type which is sub mounted below the surface of the rear panel. It is necessary to use a ball point pen or a miniature screw driver to operate it and you have to be able to see it to do this. Why not a standard size slide switch mounted just below the top of the rear panel or, better still, a button on the front panel?

While on the antenna input side of things, a six and twelve dB attenuator is switchable from the front panel. When both are pushed together, they add to give 18 dB attenuation. The front end of the FRG-100 has excellent strong signal handling capability so the attenuator won't be needed very often. Yaesu haven't provided an RF gain control. Over the last few months I have bemoaned the lack of an RF gain in some of the new transceivers, but in the case of a general coverage receiver in this class I feel the lack of an RF gain is justified.

Two connections interface with a tape recorder. The "Rec" output is a constant level of 40 mV peak and uses a standard 3.5 mm socket. A second socket supplies remote switching for the tape recorder. This uses a 2.5 mm socket. Both are located on the rear panel. The remote switching operates with the squelch control. When a signal opens the squelch, the switch operates and turns the recorder on.

Two clocks can be set for two time zones in either 12 or 24 hour modes. As long as the external power supply is left connected, the clocks are displayed even when the receiver is switched off, although there is no display illumination until the receiver is turned on again. The display and "S" meter illumination can be dimmed from the normal level. On our review receiver, the illumination of the main display and the "S" meter appeared rather different with the meter having a higher level of brightness compared to the LCD.

The memory facilities are very comprehensive. There are fifty standard memories plus two others to set scanning limits. Scanning can be set to cover all memory channels or in groups of ten. It is also possible to lock out any memories not required during scanning operations. A priority channel facility allows any memory to be checked every five seconds while the receiver is operating on another frequency.

The FRG-100 is computer compatible and several pages of the manual are devoted to this.

The FRG-100 on Test

I put the receiver through our usual series of technical tests. These were carried out with the receiver powered from a 13.8 volt regulated power supply. The sensitivity was checked first.

Sensitivity

Frequency	Sensitivity SSB for 10 dB SINAD	Sensitivity AM 10 dB SINAD	"S" 9
50 kHz	6 μV	30 μV	300 μV
150 kHz	1 μV	3 μV	70 μV
500 kHz	1 μV	3 μV	70 μV
1.0 MHz	1 μV	3 μV	50 μV
1.8 MHz	0.2 μV	0.5 μV	19 μV
3.6 MHz	0.2 μV	0.5 μV	19 μV
7.0 MHz	0.18 μV	0.4 μV	19 μV
10 MHz	0.18 μV	0.4 μV	20 μV
14 MHz	0.18 μV	0.4 μV	30 μV
18 MHz	0.2 μV	0.55 μV	32 μV
21 MHz	0.22 μV	0.6 μV	40 μV
24 MHz	0.26 μV	0.65 μV	42 μV
28 MHz	0.3 μV	0.7 μV	58 μV

The next test was for "S" meter linearity. This was checked at 14.2 MHz in USB mode.

"S" Meter Reading	Signal Input.
S1	1.4 μV
S2	1.6 μV
S3	1.8 μV
S4	2.2 μV
S5	2.8 μV
S6	4.5 μV
S7	7 μV
S8	14 μV
S9	30 μV
+20 dB	250 μV
+40 dB	240 mV
+60 dB	1800 mV

The AGC threshold was about 2 μV with the audio output increasing less than 0.5 dB above this level. Maximum audio output could be obtained with an RF input of 1.2 μV.

Selectivity was checked for the three installed filters.

SSB	AM/narrow	AM/wide
-6 dB 2.6 kHz	6.8 kHz	8.5 kHz
-40 dB 3 6 kHz	10.5 kHz	12.5 kHz

With the equipment I used to produce these figures, synthesiser noise limited me to the -40 dB measurements.

The audio output impedance is specified as 4 to 8 ohms with 1.5 watts into 4 ohms at 10% distortion. Our measurements produced 1.5 watts at 10% distortion with an 8 ohm load and 2.1 watts at 10% distortion with a 4 ohm load.

Distortion on SSB and CW at 0.5 watts output was 1% and on AM with 30% modulation distortion with 1 kHz modulation was 1.5% and with 90% modulation it had increased to 4.8%.

Frequency response was checked in the AM narrow and wide modes.

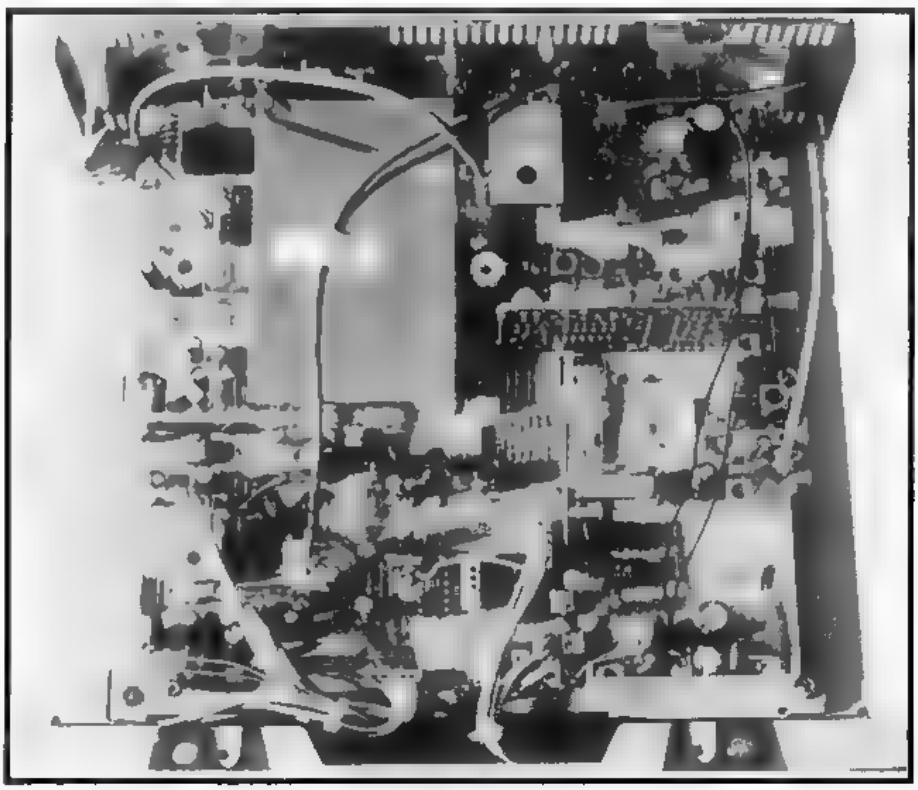
	50 Hz	75 Hz	100 Hz	250 Hz	500 Hz	1 kHz	1.5 kHz	2.5 kHz	3 kHz
Wide	-8 dB	-3.5 dB	-2 dB	+1 dB	+2 dB	0 dB	-1 dB	-5 dB	-8 dB
Narrow	-8 dB	-3.5 dB	-2 dB	+1 dB	+2 dB	0 dB	-2.5 dB	-15 dB	-20 dB

Receiver stability was checked over a long period of time and was found to be within 50 Hz of nominal at worst. Calibration of the readout was also within the above limits. This is excellent but can be improved by a factor of ten by fitting the optional high stability master oscillator, the TCXO-4.

Image and IF rejection were both excellent, all being better than -70 dB which is about the limit of my measuring equipment. Current drain at 13.8 volts was measured at 0.85 amps with no audio output and 1.2 amps at full audio output. A power supply of at least 1.5 amps output continuous would be needed to operate the receiver. The clock accuracy was checked over a three week period and was found to have gained two and a half minutes, not a very good result.

Over all, these figures are very good for a receiver in this price class. The SSB selectivity is a bit on the wide side and reflects on the low priced ceramic filters used in the 455 kHz IF. Much could be said for the AM selectivity; however, for general listening they are both quite adequate. Received audio quality is excellent in the SSB mode and good for AM. A better detector for AM with reduced distortion could make a worthwhile improvement. The internal speaker produced fairly good quality but a good external unit makes a startling improvement. Tuning ergonomics are excellent and the memory facilities should please everyone.

As delivered the receiver tunes down to 100 kHz not to 50 kHz as specified. Coverage down to 50 kHz can be enabled by pressing SSB and FM and then turning the power on. I



The FRG-100 with the top cover removed.

could find no mention of this facility in the instruction book.

The FRG-100 Instruction Manual

Yaesu instruction manuals are certainly setting the standards these days. The presentation is first class and all operating parameters are fully covered. Of the thirty nine pages, fully five are devoted to computer control. Unfortunately, Yaesu do not offer a computer control program as an option. They state that, "owing to the variety of incompatible computers used by our customers", they cannot offer programs. I believe that Dick Smith staff have produced programs for some of the later Yaesu transceivers; maybe they will work up something for the FRG-100. While no technical data is included in the manual, apart from the specification, a full circuit diagram is included.

Conclusions

By the time you read this, supplies of the FRG-100 should be available from Dick Smith outlets. If they can maintain the price at $999 with our rather sick dollar then this will represent excellent value. However, keep in mind, you will need a suitable power supply. The most suitable in the Dick Smith catalogue is the M9545 which is rated at 1.5 amps output and costs $84.95.

The FRG-100 has an excellent combination of facilities. It has excellent sensitivity, adequate selectivity and very high stability. It's all put together in an attractive package. Sure you can spend more and get better performance in perhaps one area or another but not much relative to what you will have to spend.

Our review receiver was loaned by Dick Smith Electronics and all enquiries should be directed to their store nearest to you.

"Gaalanungah 24 Sugarloaf Road Beaconsfield Upper VIC 3808

ar

RANDOM RADIATORS

With Ron Fisher VK3OM and Ron Cook VK3AFW

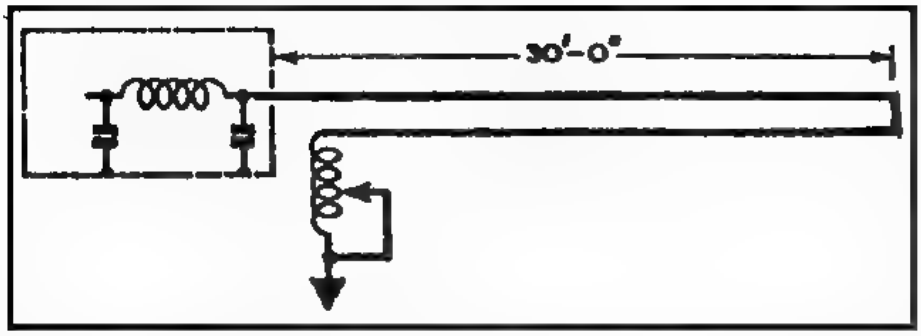


Fig. 1 The ZL1AYN "mini antenna" for 3.5 MHz.

Mini-flat-top for Eighty

Back in the good old days we had more freedom to put up full size antennas, largely due to a more tolerant and indeed interested attitude of neighbours. Today we would all like to have a small retracting vertical antenna that could be easily mounted outside on the shack wall. Of course, it would be capable of switching between low angle and high angle radiation and have a conservative 8 dBd gain on 14 to 30 MHz, 6 dBd on 10 MHz, 4 dBd on 7 MHz, 0 dBd on 3.5 MHz and, being a compromise, -3 dBd on 1.8 MHz. Some of the advertisers in overseas magazines seem to claim almost those specifications but present knowledge suggests that such an antenna is not possible. Indeed getting on 80 metres can be a real problem. In this issue we look at two compact antennas for that band.

In 1968 the May issue of our sister journal, Break-in, carried an article by ZL1AYN on a mini antenna for 3.5 MHz. It found its way into Pat Hawker's Amateur Radio Techniques, (p 212 in the 4th Edition). It was, in essence, a 30 foot (9.1 m) length of open wire line with the far end shorted. A spacing of 6 inches (150 mm) was used. One of the wires was connected directly to the output of the pi coupler and the other through a variable inductor to ground. It reportedly worked much better than just a 30 foot length of wire It could be considered to be either a shortened half of a folded dipole or a narrow loop. Opening the loop out would increase the efficiency and radiated signal. This is what Richard, G2BZQ, has done.

The March 1992 issue of ELEKTOR ELECTRONICS carries an article "The Flat-top Antenna" which is intended for apartment dwellers, although it is suitable for any restricted space application. The antenna consists of a thin rectangular loop and feeder constructed from 14 m of PVC covered 7/0.2 stranded copper wire. The loop is again narrow and rectangular, being 5.6 m by 0.36 m. The open end is fed with home-brew open wire line with 125 mm spacing. The last portion of the line is expanded to connect to the loop.

The loop is mounted horizontally and held in shape by spreaders made from the sprung edging plastic strip available in hardware stores. As shown in the sketch the feeder is only 1.2 m long and the last 0.6 m of the loop is bent down.

A resonator or ATU is used to couple the transceiver to the loop. It consists of a parallel tuned circuit with the 50 ohm point being tapped on to the coil. The loop and feeder actually form part of the coil inductance. Richard suggests slinging the antenna diagonally across the room and using thin nylon cords for support. The length of the loop should not be changed but the amount that is bent can be adjusted to suit the room size. For external mounting more rigid spreaders are suggested. A ground connection is also strongly recommended but may not be essential.

When installed inside Richard suggests that no more than 10 W of rf be used. This would reduce the interference potential as well as minimising any concern over exposure to rf fields. For outdoor

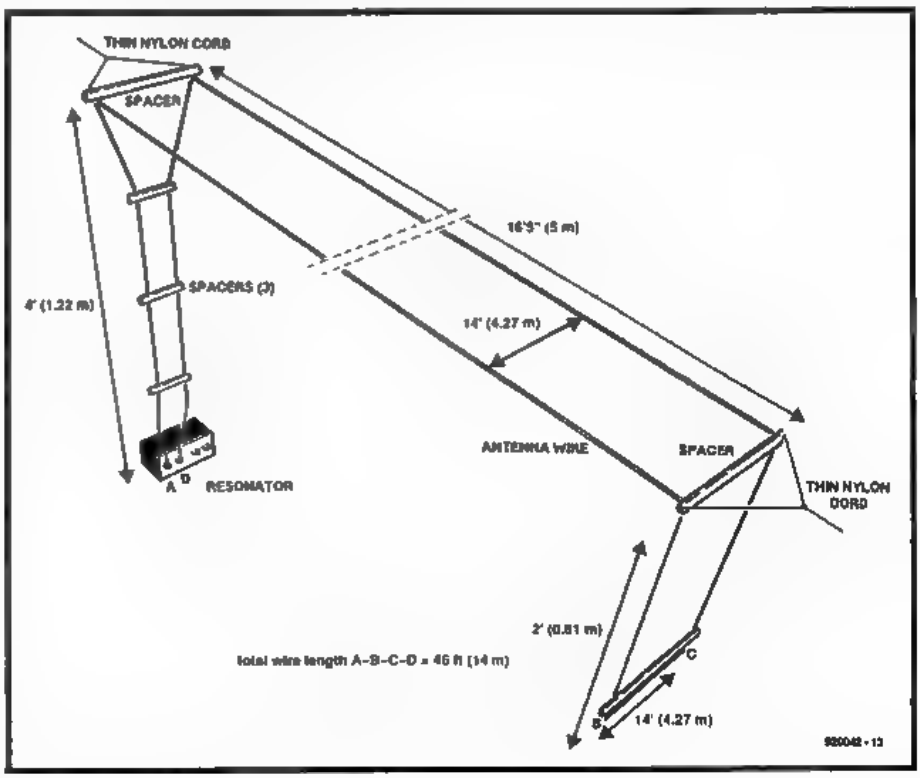


Fig. 2 The G2BZQ flat-top 80 m antenna.

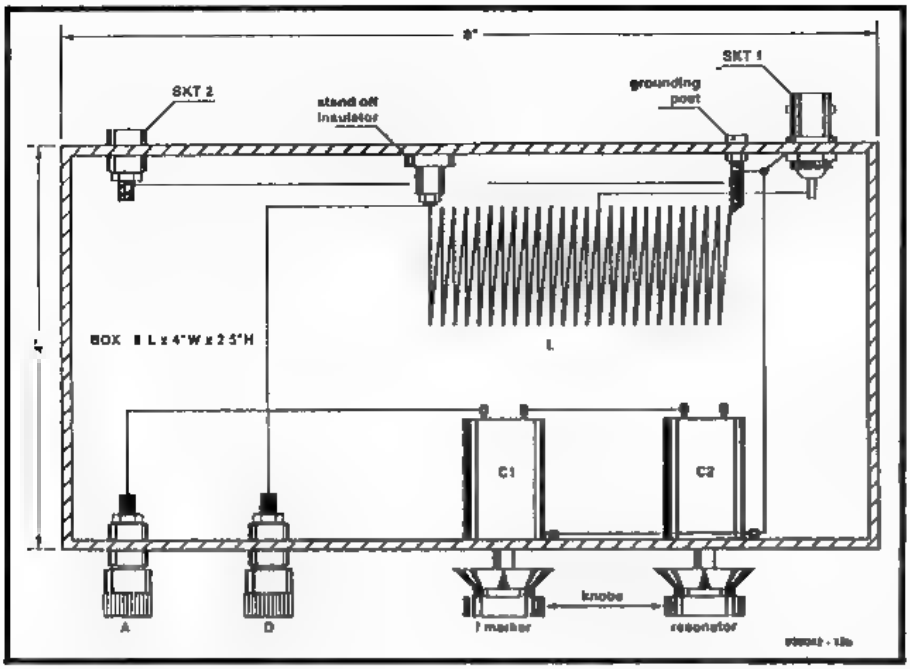


Fig. 3 G2BZQ ATU layout.

installation the basic rule of "the higher the better" applies so a longer feeder will be required. It will very likely then be necessary to use less turns for the resonator coil. Some adjustment of the coax tap may also be required to minimise the SWR. Experimenters might like to try increasing the width of the loop as well.

The Slinky Spiral Compact Antenna

In the November 1992 issue of the same journal the same author published an article titled "A Compact Spiral T/R HF Antenna". According to Richard, back in the 1970's a walking toy known as a Slinky was marketed in the USA. It was a coil of steel wire about 20 m long wound up into 90, 7 cm diameter close spaced turns. It would hop about and could "walk" down stairs. Apparently Slinkys are still manufactured by James Industries Inc. Hollidaysburg, PA 16648, USA.

Fortuitously, a Slinky can be made to resonate on 7 MHz by stretching it slightly. A company in the USA, Antenna West, (1500 North 150 West, Provo UT 84604) sells a kit of parts to make 7 or 14 MHz dipoles. Richard obtained two Slinky coils and joined them together. A nylon cord was passed through the centre of the coils and slung across the diagonal of a room. A 1.5 m single wire line was connected to the near end and fed to an ATU. A second nylon cord was used to pull the coils out to a length of 4.6 m, which is resonant in the 80 m band. A good earth connection is necessary. Quarter wave radials could be used as an alternative in high rise locations, but would need to be inductively loaded to achieve a practical length.

The ATU used by Richard was the familiar T match with two 250 pF capacitors and a tapped 26 μH inductor.

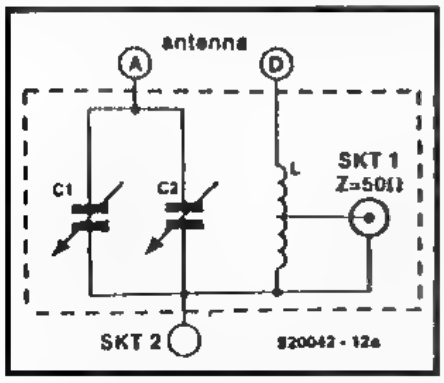


Fig. 4 ATU for G2BZQ 80 m flat-top
L1 = 19 turns of 16 SWG (1.6 mm dia) copper wire wound on a 25 mm plastic former, turns spaced 2.5 mm. Tapped at 10.75 turns from the bottom.

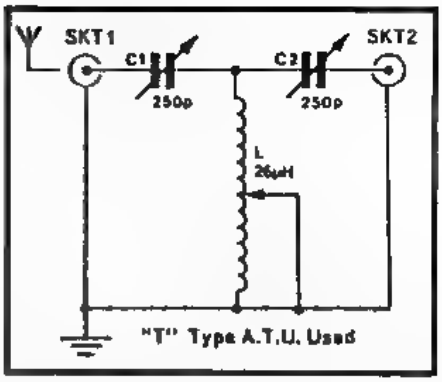


Fig. 6 ATU for use with G2BZQ compact spiral antenna.

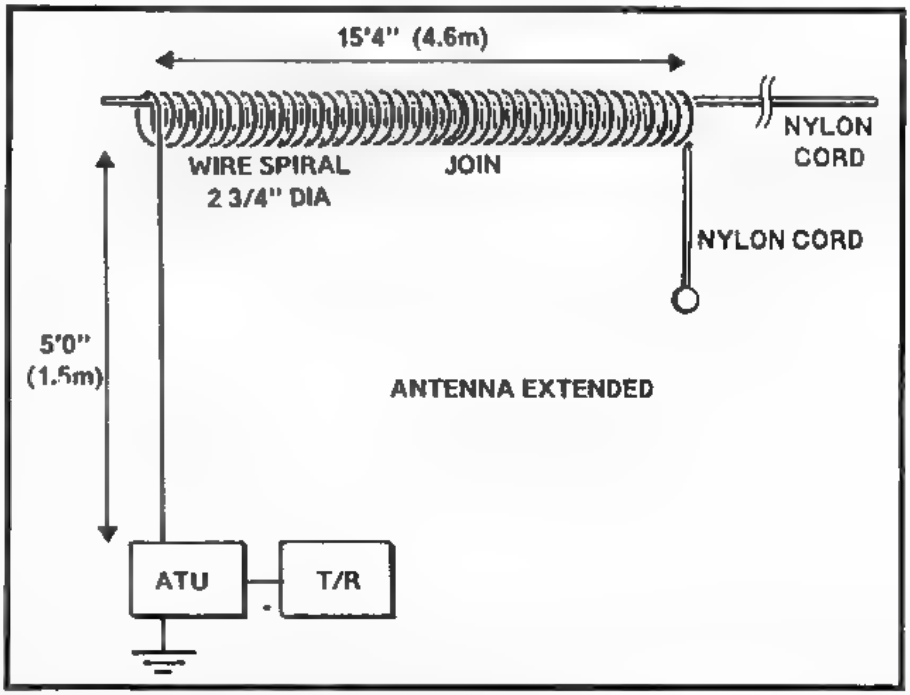


Fig. 5 The G2BZQ compact spiral HF antenna.

Mobile Magnificence!

Deluxe Handheld FM Paging Transceivers

The superb FT-415 and FT-815 hand-held FM transceivers are compact and rugged with dual-microprocessor control a range of new high-speed automatic battery-saving (ABS) features and power output which is selectable in up to four levels at 12V. A die-cast rear case, polycarbonate front panel and battery case (plus rubber gasket seals around controls and connectors) ensure reliability in the most demanding of environments. The display and keypad can both be backlit for easy night-time viewing and the 5.5-16 volt DC supply jack on the top panel can be used to power the transceiver and charge a 7.2V NiCad battery pack. A 36mm speaker provides low distortion audio, while in-built VOX circuitry is included for use with the optional YH-2 headset. Advanced features include two independent VFOs, keypad frequency entry, 41 tunable memories, instant recall CALL channel, and scanning (with programmable sub-band limits, scan skip/resume and priority monitoring). The FT-415 has Automatic Repeater Shift (Australian version) which activates whenever you tune to a standard repeater sub-band, plus extended receive coverage. Both have DTMF-based selective calling and paging facilities which allow you to program a 3-digit ID code so other transceivers can 'page' your transceiver. Comes with a high-capacity 7.2V, 1000mA/H NiCad battery, belt-clip, carry case and approved AC charger.

FT-415 Cat D-3610 **$599**

FT-815 Cat D-3615 **$699**

Specifications:

Frequency range	FT-415 144-148MHz (140-174MHz extended receive) FT-815 430-450MHz
Size	55 x 146 x 33mm
Transmitter Power Output	FT-415 2.0W (at 7.2V) FT-815 1.5W Both models 5.0W at 12V
Receiver Sensitivity	better than 0.158uV (12dB SINAD) both models, Ham bands only
Selectivity	>60dB (adjacent channel)

FT-290RII 2m Multi-Mode Transceiver

The multi-mode transportable transceiver for serious field or mobile operations! The FT-290RII features FM, SSB (USB/LSB) and CW operation with 2.5W or 250mW switchable output power, twin VFOs and 10 memories that store mode and simplex or repeater frequencies. Selectable tuning rates are provided for SSB/CW and FM, while mode-specific features such as a noise blanker and clarifier control for SSB/CW, plus a full set of functions for FM repeater operation make these units very simple to operate. Each unit comes with an FBA-8 battery holder for nine "C" size standard or NiCad batteries (not supplied), antenna and hand-held microphone. FT-290RII with flexible rubber antenna covers 144-148MHz.
Cat D-2875

2 Year Warranty!

$999

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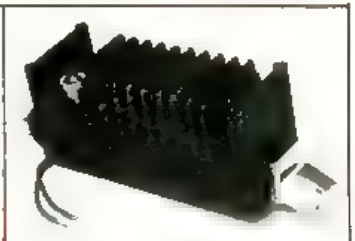
Turn your FT-290RII into a powerful mobile/base transceiver with the FL-2025 amplifier. This clip-on RF amplifier will replace the FBA-8 battery holder on the FT-290RII and boost the transceiver's output to 25 watts. Requires 13.8V DC.
Cat D-2863

$299



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- Qualified Amateur Staff for advice and assistance
- Huge range of all the latest Yaesu equipment on display, plus a large range of antennas and accessories.
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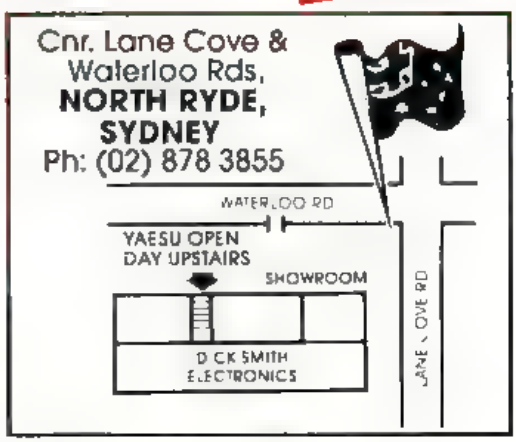


DICK SMITH ELECTRONICS

The Mk2 perspex former (left) and the Mk1 plastic pipe former Z matches constructed by Wes VK2WES.

Z-Match Comments

And finally, a letter from Wes VK2WES who writes as follows.

"After reading with interest the construction and test details by yourselves and Lloyd Butler of the "AR single coil Z-match", I constructed both the plastic pipe Mk1 and perspex Mk2 coil former models. Both are very satisfactory performers, with the Mk2 having the edge (probably biased because of the vernier controls). Identical capacitors were used on both and they are wound with 2 mm (14 gauge) enamel insulated copper wire (unable to obtain tinned material) and mounted on simple aluminium chassis. Both are very convenient to use and settings are accurately duplicated time after time. Testing has been carried out, initially using a 50 ohm load and then a G5RV (height above ground only 3 m!!), followed by a Werner Wulf multiband vertical (ground mounted) and finally a Windom fed half square dipole up 10 m. The results are excellent and parallel those of Lloyd's tests. My commercial tuner has been retired and I am using the Mk2 exclusively. Many thanks to you all for a very worthwhile project. For your information I have included a photo of them both."

Thanks Wes for sharing your experience and for those kind remarks.

So that's it for this time and it's 73 from him and 73 from me.

The two Rons.

AMSAT Australia

*Bill Magnusson VK3JT**

National co-ordinator
Graham Ratcliff VK5AGR
Packet: VK5AGR@VK5WI
AMSAT Australia net
Control station VK5AGR
Bulletin normally commences at 1000 UTC, or 0900 UTC on Sunday evening depending on daylight saving and propagation. Check-ins commence 15 minutes prior to the bulletin.

Frequencies: (again depending on propagation conditions)
Primary 7.064 MHz. (Usually during summer).

Secondary 3.685 MHz. (Usually during winter).

Frequencies +/– 5 kHz for QRM.

AMSAT Australia newsletter and software service
The newsletter is published monthly by Graham VK5AGR. Subscription is $25 for Australia, $30 for New Zealand and $35 for other countries by AIR MAIL. It is payable to AMSAT Australia addressed as follows:

AMSAT Australia
GPO Box 2141
Adelaide SA 5001

100th Issue of Amsat-VK newsletter

Congratulations to Graham VK5AGR on the production of the August 1993 issue of the Amsat-VK newsletter which was the 100th issue. One of my prized possessions is a complete set of these newsletters which date back to March 1985. They constitute a great historical record of the progress of amateur radio satellites over those years. Great work Graham. I guess the next milestone will be the 10th anniversary issue!

New Satellite launches

It has been reported from AMSAT Italy that ITAMSAT-A is currently in Kourou for final integration with the Ariane 4 launch vehicle.

The planned launch date is currently 21st Sep 1993. The orbit will be sun-synchronous with an altitude of 800 km. This satellite will share many of the characteristics of the previous MICROSATs except that it will have the capability to allow the user to employ either 1200, 4800, or 9600 baud on both the uplink and the downlink. It will have the usual "store-and-forward" bulletin board system.

Operators who are currently set up to use AO-16, LO-19 or UO-22 will not have to make any changes to their stations to work ITAMSAT-A. The modes and frequencies of operation are as follows:

Downlink:	435.867 MHz (primary)	PSK 1200 baud
	435.822 MHz (secondary)	PSK 1200 baud
		AFSK 1200 baud (FM)
		9600 baud (G3RUH)
		analog transponder (FM)
Uplink:	145.875 MHz 1200 baud Manchester/4800 baud	
	145.925 MHz 1200 baud Manchester/9600 baud /exper	

The maximum downlink power will be approximately 4 watts and the antennas will be a 4 element slanted turnstile for UHF and a 1/4 wavelength VHF "dipole". The satellite weighs about 10 kg and is about 25 cm in length on each side of its cube shape. On the same launch will be three other satellites of interest to amateurs.

EYE-Sat, a commercial micro-satellite will carry an amateur radio package built in co-operation with AMRAD, an experimentally oriented radio club in the Virginia suburbs of Washington, DC. This package is understood to incorporate both 9600 baud uplink and downlink and a 19.2 kilobaud experimental downlink. Uplink and downlink frequencies have been stated as 145.850 and 436.800 MHz respectively.

Also on the same launch will be two satellites built at the University of Surrey in England. One is KITSAT-B, which is similar to KITSAT-OSCAR 23 and the other POSAT, a satellite built with Portuguese co-operation. The latter will include an earth imaging camera which should provide amateurs with expanded opportunity to download pictures from space. It is also said to include a GPS experiment which may provide valuable data for the use of GPS on Phase 3D.

MIR educational developments

Listeners to the recent series of early morning passes of MIR will have been able to listen in on a fascinating series of exchanges between Aleksandr and Steve VK3CAX. Aleksandr has been reviewing work done by students in Steve's year 12 physics class at Hamilton College. This could well be a world first. Imagine this. You are a student in a rural Victorian town and suddenly you have the opportunity to "bounce your ideas off" a Russian cosmonaut on board an orbiting spacecraft who just happens to be a Professor from the Institute of Physics and Technology in Russia. You are able to send YOUR calculations up to him, get his reaction and incorporate his suggestions

WIA News

New WIA Members

The WIA bids a warm welcome to the following new members who were entered into the WIA Membership Register during the month of August 1993.

G7MNI	MR P CHARLTON
L20956	MR R A FRASER
L30863	MR W ELDRIDGE
L30864	MR T CUPIC
L40325	MR P FOSTER
L40326	MR A CHIANG
L40327	MR J B BRITNELL
L40328	MR J S STRAKER
L50307	MR R J J MAUMILL
L60330	MR A K HILL
L70113	MR J W BATES
L70114	MR W A STUBBINGS
L70115	MR S R BEATTIE
VK1MTB	MRS B OLDS
VK2ARR	MR I SPOLJARIC
VK2BC	MR S R HAYWOOD
VK2DMP	MR R M S MENDONCA
VK2MNA	MR D R EDWARDS
VK2TCV	MR J A GLEAVE
VK3AHD	MR A LAITY
VK3ARB	MR R O BLACKSHAW
VK3ATH	MR H HOLMES
VK3BAW	MR H HANSON
VK3BRX	MR G HANNAKER
VK3DO	MR M MACISZEWSKI
VK3ENT	MR A SOLOMON
VK3EQL	MR S J DE VOS
VK3FSD	MR J COOMBES
VK3JHO	MR P MURPHY
VK3PDX	MR D HELYAR
VK3RZ	MR M ROSS
VK3TOI	MR F MENTIPLAY
VK3TRE	MR P D WESTGARTH
VK3VEB	MR E BARCO
VK3ZDW	MR G WHITE
VK4NJE	MR N J EIJBERGEN
VK4UO	MR R JOHNSON
VK5BT	MR R C BENNETT
VK5JLH	MR J L HENRY
VK6MAP	MR M A P PERRY
VK7AZ	MR D E PARISH
VK7LDM	MR D S PONSONBY

into your experiments, exchanging data with him as the experiment continues. All this via amateur radio. Great work, Steve, and congratulations to the students involved. Aleksandr has a good command of English and quite a sense of humour. He was heard to refer to himself as "an absent minded professor" Aleksandr is photographing natural phenomena such as cyclones and volcanoes from his orbiting vantage point using a video camera with tele-photo lens. He will be using this material for a series he is putting together called "Lessons from Space".

Amsat-UK symposium

This annual event has come and gone for 1993. From all accounts it was again a huge success. One interesting observation conveyed in a recent packet bulletin was (unofficial) concern over the growing number of satellites with digital capability and how to make the most efficient use of them. This problem exists already with lots of duplication of files, etc on the current digital birds. It's a problem crying out for a solution. Hopefully it will be addressed in the near future and some sort of "Gentleman's agreement" reached so that all users can benefit from the fantastic facility that these birds represent.

Arsene experiences its first shut-down

As this column goes to press Arsene has been shut down to prevent over-heating. This is due to orbital characteristics presenting a particular face to the sun for long periods. It may well become a feature of the on-going management of the satellite to have short periods of shut down. In the meantime the list of users is growing and the variety of rigs and, in particular, antennas is of interest. Some stations appear to be using quite modest antennas. One listed a hand held helix. The main problems appear to be the fact that the radiation pattern of the on-board antennas is quite sharp and that the frequency is way outside the normal bottom edge listening window on S band. Converter efficiency falls off at the top edge of this band where the Arsene downlink is situated and it calls for a specially designed converter for the 2450 MHz end of the band. The sharpness of the antennas restricts the times when good QSOs can be made. As more activity is reported these times will become better known

English amateur to build 2 metre transmitter for phase 3D

An announcement was made at the recent Amsat-UK colloquium that a high power 2 metre transmit module would be jointly sponsored by Amsat-UK and Amsat-NA. It was feared that such a device would not fly on phase 3D as no definite offers had come forward for its construction. However, Mike Dorset G6GEJ has made a submission to the crew at Marburg and it has been decided to authorise him to go ahead with construction to his design This means that with the planned matrix switching it will be possible to have a mode B option on this satellite.

*359 Williamstown Rd Yarraville VIC 3013
Packet: VK3JT@VK3BBS

ALARA

*Robyn Gladwin VK3ENX**

Pixie Chapple VK2KPC at the 2nd Riverina Field Day

ALARA Banner Flies Again

Many thanks to Barry Gilmour VK2KUZ for the kind invitation to represent ALARA at the 2nd Riverina Field Day held recently by the Wagga Wagga Amateur Radio Club. The venue was the Murrumbidgee Turf Club and Barry was ably assisted with the organisation of the event by his wife, Anne VK2MKJ. A dinner was held to mark the 25th anniversary of the Wagga Wagga Amateur Radio Club, at which Bill Roper VK3BR was the guest speaker. It gave me great pleasure to meet Pixie Chapple VK2KPC, pictured at the Field Day, for the first time.

Silent Key VK5CKP

It is with great sadness that we record the loss of ALARA member Irene Wilson VK5CKP. She was an enterprising, literate lady with a delightfully supportive (non-amateur) husband and talented children and grandchildren.

Fluent in French, German and Italian, involved in Musica Viva, bridge, chess, Scrabble (in four languages), weaving and gardening, she was introduced to amateur radio by Colin Heath VK5FX. She attended her first ALARA luncheon in 1991. By the '92 lunch she was already VK5KCP and working for her full call which she acquired in August 1992.

With an iambic paddle and practice QSOs supplied by Colin, she was increasing her speed and confidence in this, her fifth language. Sadly, she died before she could enjoy her third ALARA luncheon. In such a short time she did so much! 88/33 Irene

Sincere thanks go to Denise Robertson VK5YL for this tribute. Irene Wilson was 80 years old when she obtained her Amateur Operator's Certificate of Proficiency and she will be remembered as an inspiration to all who seek to attain excellence.

*PO Box 438 Chelsea 3196 VK3ENX@VK3YZW

AWARDS

*John Kelleher VK3DP — Federal Awards Manager**

Redcliffe and Districts Radio Club Awards

The following award information is for Awards sponsored by the Redcliffe and Districts Radio Club. The Redcliffe City Award has over 750 recipients in 57 countries whilst the Basic grade of the Rally Australia Award has been presented 14 times and the Enhanced grade 5 times within VK and ZL.

Redcliffe and Districts Radio Club Rally Australia Award

1. The object of this award is to travel around Australia by radio, making progressive contacts as you go. Valid contacts are those made on or after 1st October 1986.

2. The award is available in two grades:

(a) The BASIC Award is a two colour certificate printed on parchment style card.

(b) The ENHANCED Award is an etched aluminium Plaque in gold on a black background. It will be engraved with the recipients details.

3. The two grades are totally separate awards. It is not necessary to complete the BASIC award before attempting the ENHANCED award. Contacts made for one award do not count toward the other.

4. BAND and MODE endorsements are available.

5. Shortwave listeners are eligible to participate in these awards. These rules, with the inclusion of the callsigns of both stations logged, apply.

6. Basic Rally Australia Award

(a) This award requires contacts with 25 Cities and Towns around Australia.

(b) The FIRST and also the FINAL contact must be with a Redcliffe member. These contacts are deemed to be the Redcliffe check point regardless of the members QTH.

(c) THE FOLLOWING CITIES ARE MANDATORY CHECKPOINTS : Redcliffe, Brisbane, Sydney, Canberra, Melbourne, Hobart, Adelaide, Perth, Darwin, Mt Isa, Townsville, Redcliffe.

(d) A further 2 contacts in each of VK2, VK3, VK4 VK5 and VK6 with a further 1 contact in each of VK1, VK7 and VK8. These contacts must be made in progressive order with the mandatory contacts.

(e) The rally may be run in either direction (ie Redcliffe — Sydney or Redcliffe — Townsville etc).

7. Enhanced Rally Australia Award

(a) This award requires the accumulation of 1000 points from progressive contacts throughout Australia.

(b) Contact with the mandatory checkpoints (as per the BASIC award) are required.

(c) Points are awarded as follows for contacts within: VK1...20pts, VK2.. 10pts, VK3...10pts, VK4...10pts, VK5...10pts, VK6...10pts, VK7 20pts, VK8...20pts.

8. Applications

(a) Applications for these awards should be accompanied by a certified log extract, signed by two other Amateurs, showing date, time, frequency, callsign and location of station worked.

(b) The cost of the BASIC Award is $A4.00 or 6 IRCs.

(c) The cost of the ENHANCED Award is $A25.00 or 36 IRCs.

(d) Applications for these awards should be sent to: The Awards Manager, Redcliffe & Districts Radio Club, PO Box 20, Woody Point, QLD 4019.

9. Contact Information

(a) Contact with a Redcliffe member is only required for the start and finish contact. Any licensed Amateur may be worked for all other contacts.

(b) The Redcliffe club conducts a net every Sunday on 3.612 MHz at 0930 z under the callsign VK4RC. Club station VK4IZ can also be heard in most VK contests. A list of members can be had by sending a SASE to the Awards Manager

Redcliffe and Districts Radio Club Redcliffe City Award

1. The Redcliffe City Award requires an Amateur station in VK or ZL to contact Redcliffe club station VK4RC or VK4IZ and four club members to qualify.

2. Any Amateur station other than in VK or ZL requires contact with Redcliffe club station VK4RC or VK4IZ and two club members to qualify.

3. BAND and MODE endorsements are available.

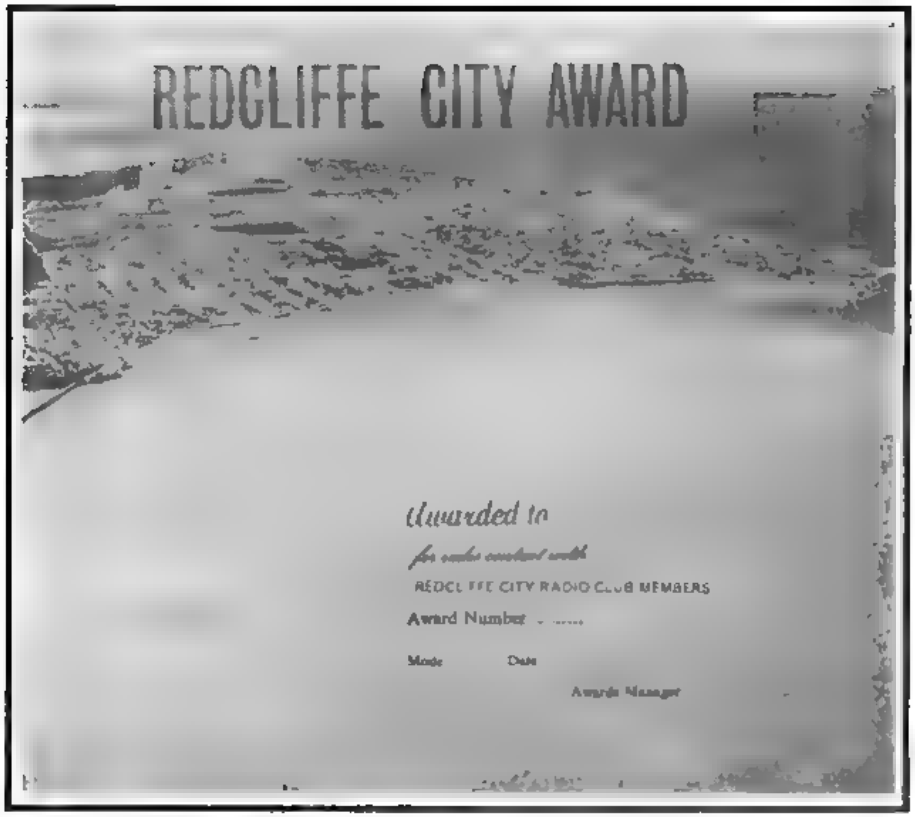
4. Shortwave listeners are eligible to participate in this award. These rules, with the inclusion of the callsigns of both stations logged, apply

5. Applications

(a) Applications for this award should be accompanied by a log extract showing date, time, frequency, callsign and location of station worked.

(b) The cost of the Award is $A2.00 or 3 IRCs.

(c) Applications for these awards should be sent to: The Awards Manager, Redcliffe & Districts Radio Club, PO Box 20, Woody Point, QLD 4019.



6. Contact Information

The Redcliffe club conducts a net every Sunday on 3.612 MHz at 0930 z under the callsign VK4RC. Club station VK4IZ can also be heard in most VK contests. A list of members can be had by sending an SASE to the Awards Manager.

Belarus Award

Work UC or RC amateurs in the oblasts listed. 2nd class = 20 UC/RC in 3 oblasts. 1st class = 30 UC/RC in 4 oblasts. Oblasts in this area are:

005 L Brest
006 W Vitebsk
007 P Gomel
008 I Grodno
009 C Minsk
010 S Mogilev
188 A Minsk City

No band or mode restrictions. GCR list with 7 IRCs or equivalent to: Gene Zhukovski, Box 33, Minsk — 13, 220013, USSR.

Canada Award

Confirm 2 way contact with all Canadian provinces and territories. Endorsements for any band 160 — 6 metres, and any mode via OSCAR satellite. Modes may be mixed, all CW, SSB, or RTTY. Contacts after 1st July 1977. Send cards or GCR list plus $US8.00 to: CARF Awards Manager, PO Box 356, Kingston, Ontario, Canada K7L 4W2. Provinces and territories needed are:

VO1/VO2	Newfoundland and Labrador
VE1	Prince Edward Island
VE1	Nova Scotia
VE1	New Brunswick
VE2	Quebec
VE3	Ontario
VE4	Manitoba
VE5	Saskatchewan
VE6	Alberta
VE7	British Columbia
VE8	Nor/West Territory
VY1	Yukon Territory

The Labre Award — Brazil

The Labre Award is awarded for proof of contact with 45 or more countries of the American area. GCR list with 10 IRCs or equivalent. The qualifying countries are:

Sign up a new member today — We need the numbers to protect our frequencies and privileges.

Chile, Easter Is, Juan Fernandez, San Felix, Cuba, Uruguay, Guadeloupe, Martinique, Fr Polynesia, Clipperton Is, St Pierre & M, St Martin, Fr Guiana, Ecuador, Galapagos Is, Haiti, Dominican Rep, Columbia, Malpelo Is, San Andres Is, Panama, Honduras, Grenada, St Lucia, Dominica, USA, Navassa Is, Guantanamo Bay, Alaska, Puerto Rico, Desecheo Is, Virgin Is (US), Argentina, Greenland, Neth Antilles, Sint Maarten, Peru, Brazil, Fernando de Noronha, St Peter & Paul Rocks, Trinidade Is, Surinam, Guatemala, Costa Rica, Cocos Is, Canada, Belize, Antigua, Anguilla, St Kitts & Nevis, Montserrat, St Vincent, British Virgin Is, Turks & Caicos, Bahamas, Antarctica (VP8/LU), Falklands Is, Sth Georgia, Sth Orkney, Sth Sandwich, Sth Shetland, Bermuda, Mexico, Revilla Gigedo, Nicaragua, El Salvador, Venezuela, Aves Is, Cayman Is, Paraguay, Jamaica, Barbados, Guyana, Trin/Tobago.

There are no date requirements. 3 types of certificates are awarded for mixed phone/CW, phone, and CW. The address for submissions is: Labre Headquarters (Award Manager), PO Box 07-004, 70359 Brasilia DF Brasil

**PO Box 300 Caulfield South 3162*

ar

CLUB CORNER

Western Australian Hamfest 1990

The premium amateur radio, CB and electronics event in Western Australia will be held this year on Sunday 14th November, with bigger and better facilities at a new location. To deal with the increasing number of visitors to Hamfest from all over WA and interstate, the **Northern Corridor Radio Group** in Perth has moved the annual event to: The Len Hansman Community Centre, 246 Walter Road, Morley, WA, 6062.

The centre, opposite Coventrys, is about 7 km from the centre of Perth and offers covered facilities, in a large sports hall, for visitors and trade exhibitors. In addition there is extensive on-site car parking and ample room for our ever expanding Car Boot Sale.

For those of you who like to see the show but have old equipment to sell, the NCRG will be running its popular "Bring and Buy" stall, where we will sell your pre-loved radios for a modest fee. A refreshments stand will also be put on, as in past events, with pies, pasties, tea and coffee and soft drinks available, plus space to sit and chat.

We are encouraging exhibitors to offer "show specials", so why not save that purchase until Hamfest, when you should be able to see everything from the Yaesu FT-1000 to the Kenwood TS-50S, all within the space of 100 m!

The show opens to the public at 10 am, with trade access from 8 am. The entrance fee for visitors is $2, which also includes a ticket in the NCRG door raffle which will be drawn before the show closes at 4 pm.

There is a $20 fee for trade exhibitors showing in the hall, with tables being available for hire at $5 each (maximum of 3 per exhibitor). Those visitors wishing to sell equipment at the Car Boot Sale can buy space at $10 per car, in a specially designated uncovered sales area.

Trade bookings will be taken on a first with cash, first served basis and Keith Bainbridge VK6XH, the HamFest Organiser will be pleased to talk to you about your requirements on (09) 279 4923.

Talk-in is hoped to be provided from 0900, for the early hours of Hamfest, provisionally on 144.500 simplex or duplex — 146.025 (input)/146.625 (output) or 146.200/146.800.

Hamfest has been run by the Northern Corridor Radio Group for the last five years. Last year saw an estimated 500-plus visitors, with amateurs making the trip from as far away as NSW and Victoria, Albany and Esperance in WA's far South and the Pilbara and Karratha in the North.

All the big names in the trade have traditionally attended the event, with representation last year from Emtronics, Dick Smith Electronics, Andrews Communications and West-Am, showing between them Yaesu, Kenwood and Icom equipment, as well as products from less common but highly prized manufacturers such as Bencher and MFJ.

In addition, the Wireless Institute of Australia has run a bookstand, with a wide range of Australian, British and American books. Local WA manufacturers of radio equipment and aerials are always well represented, with everything from HF to CB to Microwave equipment available. Those visitors with special interests have been traditionally well catered for, with exhibits from UHF/Microwave, digital, repeater and QRP groups from around WA.

Keith Bainbridge VK6XH

Australian Naval Amateur Radio Society

Membership is growing steadily, Since our launch on 9th August 1993 the SMA has decided that the callsign VK1RAN should be returned to the overseas based RNARS and have issued the Australian Naval Amateur Radio Society with the distinctive callsign VK1SEA.

Close association is maintained with the Royal Australian Navy as this Society also has the callsign VK1VHP which will be used on special occasions. It is a suffix well known to all Navy and merchant navy communicators as VHP is the callsign of the Royal Australian Navy's main communication station in Canberra — HMAS Harman

The ANARS conducts a regular "Navy Net" on 3620 kHz (+/– QRM) LSB every Wednesday evening commencing 1000 hours UTC (8pm EAST). All seafarers, past and present, are invited to join this net.

Terry Clark VK2ALG

Ballarat Amateur Radio Group Hamvention

Gearing up for the Xmas holidays and need that final piece of gear to set up your rig for those lazy days ahead?

Then the BARG Hamvention is the place where you ought to be on 30th and 31st October. Trade displays and bargain tables will have a host of new and used goodies for your perusal, and no doubt you will be able to make a purchase to fit your rig and your pocket

Perhaps you might have to sell some pre-loved gear to make your new purchase. Why not hire some trestle space and do someone else a favour by selling them some of your tried and tested gear, and some junk, so as they can continue to enjoy our hobby, perhaps in a different field. Trestle space is available at $10.00 for 8 feet, and $7.50 for 6 feet.

The Saturday is confined to fox hunting (starting at 3.30 pm) and a 2 m scramble at 6.45 pm precedes the Hamvention Dinner which will be held at the Western Hotel at 7.00 pm.

At 9.00 am on the Sunday the beautiful Ballarat weather will set the scene for one of the best amateur radio events on the calendar.

Entrance to the venue will cost $5.00, or $10.00 if you elect to stay and enjoy a meal prepared by our hard working XYLs. You may even be lucky enough to win a door prize.

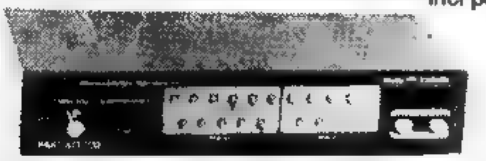
To make your booking for the Hamvention dinner on the Saturday evening, or to arrange trestle space, please contact the co-ordinator, Tom George VK3DMK, as soon as possible on 053 32 7234 and 053 35 5662 AH

Club Net — All amateurs are reminded that they are welcome to participate in the club net at 2000 hours EAST on Thursday evenings on 3610 kHz +/– QRM. The net is usually well supported and you could become eligible for one of the club's three awards, one of which, the DX Widows Award, recognises your XYL's tolerance of your behaviour as you work that ever elusive DX. Details of the award are given during the net

Norm D'Angri VK3LBA

DATA PRODUCTS low cost

We have sold over 1200 PK-232 MBX
- The world's best multi-mode data controller **$750** incl pactor



PK-232 MBX Multi-mode Data Controller:

Most popular multi-mode controller ever made. RS-232 compatible controller for Packet, Baudot and ASCII RTTY, AMTOR/SITOR ARQ and FEC. Morse code and WEFAX, also receives NAVTEX/AMTEX and TDM. superior CHEBYSHEV filter design for better copy, built in 16K byte Packet TM personal packet maildrop with auto forwarding. SIAM TM for automatic RTTY signal identification. KISS mode for TCP/IP compatibility. Host Mode for user-friendly software interface. cables and connectors included.

ROTATORS GALORE

Grab your Kenpro Rotator before the price hike! Unstable Dollar will force increases in the near future!

KR 400
KR 400RC
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Dual Azmith/Elevation
Stay Bearings & Rotator Cable in stock

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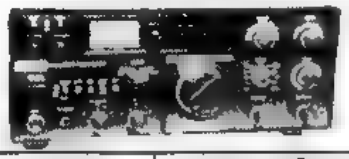
AT THE BEST PRICES IN ALL EMTRONICS STORES

THE CLASSIC GREAT SPECIAL

All new all band transceiver from Emtronics at 1980 prices

$899 BANDO - 5D
HF ALL BAND RECEIVER
COMPLETE WITH MIC & BUILT-IN POWER SUPPLY

The transceiver is ideal for the newcomer as well as experienced operators. It operates from 80 through to the 10 metre band including WARC. It has an extremely sensitive receiver (0.25uV 10dB S/N) and adjustable output power from a few watts to 220W PEP. NB, IF shift, RIT, RF Processor and many other features. This radio will suit everybody's requirements and pocket



ANTENNA ROTATOR PACKAGES - ONLY UNTIL 31/10/93

	R.R.P.	SPECIAL
KR-400 + TE-33	$1,175.00	$1,100.00
KR400RC + TE-33	$1,250.00	$1,175.00
KR400 + TE-23M	$1,100.00	$1,025.00
KR1000 + TE-HB-35C	$2,135.00	$1,950.00

FOR THE SWL RECEIVERS

★LOWE HF225
★LOWE HF 150
★KENWOOD R5000
★AR3000a
★ICOM R72
★ICOM R100

NEW MODEL IS HERE

AR-3000A

100KHz 2036 MHz CONTINUOUS
LF-MF-HF-VHF-UHF-SHF all mode AM
SSB-FM monitoring and surveillance
PROFESSIONAL RECEIVER
SBEST IN AUSTRALIA

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★Noise Bridge EMTRON EMB-2
★Power Supplies Kenwood from $430
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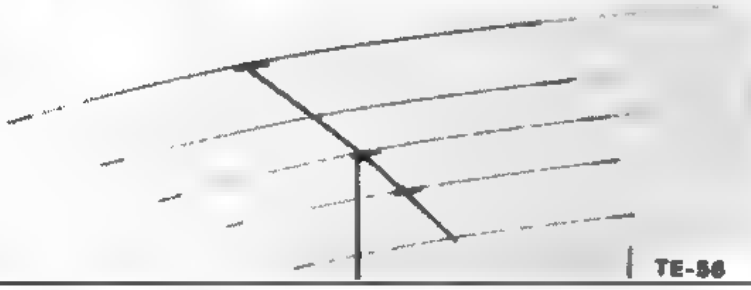
★ Co-ax switches ★ EMTRON TUNERS

TET-Emtron ANTENNA SYSTEMS

DESIGNED AND MADE IN **AUSTRALIA**



TE-56

ED-52C ALL BAND WIRE TRAP ANTENNA

* Completely factory assembled ready to use.
* Heavy 14 (7/22) guage standard copper antenna wire to survive those severe storms.
* Centre fed tuned feedline supplied.
* Only two traps
* Includes centre insulator with an eye hook for centre support.
* Includes custom insulators molded of top quality material with high dielectric qualities and excellent weatherability.
* Complete installation instructions included.
* Overall length 33 mtrs less when erected as an inverted vee or sloper
* Handles 2 kw PEP & covers 80 through 10 metres **$179**

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TE-23	2 element 3 band 14/21/28	$414.00
TE-23M	2 element 3 band mini 14/21/28	$440.00
TE-33	3 element 3 band 14/21/28	$575.00
TE-43	4 element 3 band 14/21/28	$750.00
HB-35C	5 element trapless 14/21/28	$990.00

TE - 4 BAND SERIES

TE-34	3 element 14/21/28 1 element 7Mhz	$695.00
TE-44	4 element 14/21/28 1 element 7Mhz	$870.00
TE-433HB	3 element 14/21/28 2 element 7Mhz	$850.00
TE-443HB	4 element 14/21/28 3 element 7Mhz	$1100.00

TE - 6 BAND SERIES

TE-26	1 elem 14/21/28 1 elem 10/18/25	$380.00
TE 46	3 elem 14/21/28 1 elem 10/18/25	$750.00
TE-56	3 elem 14/21/28 2 elem 10/18/25	$1075.00

TE - 7 BAND SERIES

TE-47 3 elem 14/21/28 1 elem 10/18/25 1 elem 7Mhz $995.00
TE-57 3 elem 14/21/28 2 elem 10/18/25 1 elem 7Mhz $1200.00

TET-EMTRON VERTICAL ANTENNAS
EV-3, 14-21-28 MHz, $149
EV-3W, ALL WARC BANDS, $189
NEW EV-5, 3.5-7-14-21-28 MHz
UNIQUE NEW ANTENNA - $299

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Contests

*P Nesbit VK3APN — Federal Contest Coordinator**

Contest Calendar Oct-Dec 93

Oct 2/3	VK/ZL/Oceania DX Contest (SSB)	(Sep 93)
Oct 3	RSGB 21/28 MHz Contest (SSB)	(Sep 93)
Oct 9/10	VK/ZL/Oceania DX Contest (CW)	(Sep 93)
Oct 9/10	Iberoamericano Contest (SSB)	(Sep 93)
Oct 13/14	YLRL Anniversary Party (CW)	(Sep 93)
Oct 16/17	Worked All Germany Contest (Mixed)	(Sep 93)
Oct 17	RSGB 21/28 MHz Contest (CW)	(Sep 93)
Oct 23/24	CQ WW DX Contest (Phone)	(Sep 93)
Oct 27/28	YLRL Anniversary Party (SSB)	(Sep 93)
Nov 1/7	HA-QRP 80 m CW Contest	
Nov 13	ALARA Contest (Mixed)	
Nov 13/14	WAE RTTY DX Contest	(Jul 93)
Nov 13/14	OK-DX CW Contest	
Nov 13/14	ARRL International EME Competition	
Nov 27/28	CQ World-Wide CW DX Contest	(Sep 93)
Dec 4/5	ARRL 160 m Contest	
Dec 11/12	ARRL 10 m Contest	
Dec 31	ARRL Straight Key Night	

Finishing off this column at 2 am, and starting to feel like a sleepwalking robot, puts me in mind of those late night contests where one wakes up to find that one has been calling, or possibly working, stations whilst 99% asleep. The worst thing is not knowing whether the station whose callsign you are sending is one you want to work, have just worked, or are supposed to send a number to. How embarrassing! How confusing to the poor DX station! It's alright for the big guns, whose high QSO rates no doubt provide the stimulus to stay awake, but for us lesser mortals for whom a 2 am dogpile consists of working a JA or W6 every 5 minutes or so, the urge to fall asleep can be overwhelming. Who ever devised this crazy hobby?

I'll spare you further philosophy (mainly because I want to go to bed), and launch straight into this month's contest news. Many thanks to the following for their help, information, and inspiration: VK2PS, VK2SRM, VK3DMS, ZL1AAS, OK2FD, CQ, QST, and Radio Communications. Please keep the letters coming, including any spare copies of rules or results. Until next month, good contesting!

73, Peter VK3APN

Contest Details

The following contest details should be read in conjunction with the "General Rules & Definitions" published in April AR.

HA-QRP 80 m CW Contest

November 1 to 7

This international contest takes place each year from 0000 z November 1st to 2400 z November 7th, and is open to stations running **up to 10 W input power.** Use 3560-3600 kHz, CW only. Call "CQ TEST QRP", and exchange RST, QTH, and names. Score 1 point per QSO with own country, and 2 points per QSO with EU and DX. Stations can be contacted only once during the contest for points credit. The final score equals QSO points times DXCC countries worked. Logs must show date/time (to the nearest minute), callsign, reports, and QTH and name of operator worked. Summary sheet must include first name and QTH sent during the contest, TX input power, and TX output device. Send logs postmarked by 21 November to: Radiotechnika Szerkesztosege, Budapest, Pf.603, H-1374 Hungary. All entrants will receive participatory certificates, and outstanding scorers will receive a free subscription to Radiotechnika magazine for one year.

ALARA Contest (Mixed)

Saturday November 13, 0001-2359 z

This phone/CW contest is open to amateurs and SWLs throughout the world. YLs work everyone, OMs and Clubs work YLs only. Bands are 80-10 m, and suggested frequencies are 28380-28410, 21380-21410, 21170-21200, 14250-14280, 7070-7100, & 3560-3590 kHz. Each station can be contacted twice per band — once on phone, and once on CW. No lists, nets or crossmode contacts please.

YLs call "CQ ALARA CONTEST" or "CQ TEST ALARA", and OMs call "CQ YL". ALARA members send RS(T) + serial, whether ALARA member, and name. OMs and Club stations send RS(T) + serial, name, and whether Club station. Club station operators **must** identify as a club station each contact, and cannot use personal callsigns whilst operating as a Club member. Score 5 points for each ALARA member QSO, 4 points for each YL non-member QSO, and 3 points for each OM or Club station QSO. On CW, if either operator is a Novice, score double points. SWLs score 5 points per ALARA member logged, and 4 points per YL non-member logged.

Logs should show date/time UTC, band, mode, callsign worked, RS(T)/serial sent and received, name of operator worked, status of the station worked (YL ALARA, YL non-member, or Club), and points. Attach a cover sheet showing all standard information and send to: "Mrs Marilyn Syme VK3DMS, Box 91, Irymple 3498, Vic., Australia" to be received by 31 December 1993.

The Florence McKenzie CW Trophy will be awarded to the highest scoring VK YL novice (minimum 50 points). Because of its size and weight, the actual trophy will not be forwarded, and instead a certificate bearing a photo of the trophy will be sent to the winner. Trophies will also be awarded to the top scoring Australian and DX YLs. A comprehensive range of certificates will also be awarded.

OK-DX CW Contest

1200 z Sat November 13 to 1200 z Sun November 14

This CW contest occurs in the second full weekend in November each year. Bands 160-10 m. Categories are: Single operator, single and multiband; multioperator, single and multi TX; QRP, single and multiband (max 5 W out); and SWL. Single operator stations operate max 20 hours, with minimum 1 hour rest periods. Multiband stations apply "10 minute band change rule" (multi TX stations exempt)

Send RST plus serial; OK stations will send RST plus 3 letter district code. DX (VK) stations score 10 points per OK/OL/OM QSO, and 1 point per QSO with another country. Multipliers are the sum of DXCC countries and OK districts on each band; final score is QSO points (all bands) times multiplier from all bands.

Note rest periods in the log, and use a separate log for each band. Cross-check sheets are required for 200+ QSOs. Logs can also be submitted in ASCII on DOS disk. Entries should be postmarked by 15th December, and sent to: "CSRK, Box 69, 113 27 Praha 1, Czech Republic".

Results of 1992 Barcelona Olympic Games HF Contest

Band	QSOs	Points	Zones	Prefixes	Score
VK4TT	14 80	230	14	42	12880
VK4XA	A 60	248	21	40	15128

Results of 1992 CQ WW RTTY Contest

Band	Score	QSOs	Points	Zones	Countries	States & Provinces
Single operator						
VK2BEX*	A	96,520	260	760 41	53	33
VK3EBP*	14	24,905	100	293 22	43	20
VK2BQQ	A	14,260	75	215 23	24	21
VK2EG	A	7,625	44	125 21	25	15
Multioperator single TX						
VK2RT*		151,632	326	972 36	61	59
VK4WIE		71,540	178	511 42	71	27

*Certificate winners

Results of 1992 SAC Contest

VK2APK won the plaque for Oceania in both CW and SSB categories.

	QSOs	Mult	Pts	Final Score
(* = certificate)				
CW:				
VK2APK*	267	89	413	36,757
VK4TT	65	36	65	2,340
SSB				
VK2APK*	193	73	263	19,199
VK4UA	135	80	135	10,800

Results of WIA 1993 Novice Contest

This year's contest attracted 34 entries, with 25 in Section A (Phone), 9 in Section B (CW), and none in Section C (SWL). The Keith Howard VK2AKX Trophy was awarded to VK5MAP, the novice with the highest score in Section A (Phone), and the Clive Burns Memorial Trophy to VK2JSB, the novice with the highest score in Section B (CW).

These perpetual trophies are on permanent display at the Executive Office, and in each case the winner receives a suitably inscribed wall plaque.

Section A Novice winner: VK5MAP
Section A AOCP winner: VK3APC
Section B Novice winner: VK2JSB
Section B AOCP winner: VK3EFO

Section A (Phone):

VK5MAP	882	VK3LBA	120
VK3APC	878	VK6PDJ	66
VK6WJH*	766	VK5QZ	50
VK2LEE**	699	VK6BWI	49
VK4MWK**	644	VK3DYF	42
VK5NYD**	560	VK1JE	41
VK7MGS**	493	VK2VZB	31
VK5AYD*	423	Section B (CW):	
VK3GH*	408	VK2JSB	76
VK5ATU	391	VK2VZB**	74
VK3NAH**	270	VK3EFO	71
VK1MOJ**	263	VK2SPS*	70
VK5PAY	236	VK6AFW	52
VK3JJF	236	VK2CW	50
VK4KJD	213	VK3XB	47
VK1KLB	198	VK2AZR	22
ZL1GQ	152	VK6BWI	10
VK5UE	137		

** Highest aggregate novice score for each state, excluding National winners.
* Special awards.

Comments Contest participation was well down on last year, which was rather disappointing. Some logs did not comply with the rules, eg providing a summary sheet (refer to General Rules & Definitions, April AR). Finally I would like to thank all participants in the contest and look forward to a better roll-up next year

73, Ray Milliken VK2SRM
Novice Contest Manager
PO Box 300 Caulfield South VIC 3162

ar

WIA News

Stereo TV Interference to VHF Bands

There is some relief in sight from TV stereo sound channel interference for operators who inhabit the lower end of the 52 and 144 MHz bands.

Interference from the dual-channel (stereo) sound channel transmissions of Channel 0 and Channel 5A stations located around Australia have long been of concern to amateurs who use the lower ends of the six and two metre bands, where much weak signal long distance work takes place.

The sidebands of these sound transmissions "spill" into the lower edge of these bands, interfering with reception, particularly of weak (DX) signals.

Following investigations into the problem through the WIA Federal Technical Advisory Committee (FeTAC), in 1992 the Federal Council requested the then General Manager/Secretary, Bill Roper, to approach the then Department of Transport and Communications to see what could be done.

This was followed up with a letter to the Australian Broadcasting Authority (ABA) in June this year. In August, the ABA's Robert Greeney, Director of Engineering, Planning Division, replied.

Greeney points out that all of the NSW sites mentioned by the WIA have been "phased out of operation", and Channel 0 at Gordonvale in Queensland has ceased operation.

However, the ABA does not have plans to clear Channel 0 and "therefore it is to be regarded it is an integral part of the television broadcasting service bands for the foreseeable future," Greeney says.

On the matter of Channel 5A and two metres, Greeney says, "The removal of Channel 5A at Newcastle will cause some disruption to reception of the ABC services for some viewers, particularly those without VHF receive antennas, however clearance of ABHN5A in the Hunter Valley will happen after a date for the clearance is decided."

He gave no indication of when that decision might be.

Greeney went on to explain that RTQ5A at Toowoomba has permission to continue operation until 1994, despite the station operating on a UHF channel from nearby Mt Lofty.

He did note that Channel 5A stations at Townsville North and Nambour had both ceased operation and that MTN5A, at Hay in NSW, would be clearing to another channel in late 1994. Aggregation in Tasmania will see TNT5A at Wynyard moving to UHF after April 1994.

Greeney says that clearance of other Channel 5A services around Australia will be considered during the licence area planning investigations going on over the next two and a half years.

The WIA had suggested that services on Channel 5A be relocated to Channel 9A, but Mr Greeney says that there are no plans to do this at present, pointing out that Channel 9A cannot be used for broadcasting services yet. However, it is expected to be available after 1996.

"In addition," Greeney says, "Channels 9A and 12, when they do become available, will be used to replace Band II channels 3, 4 and 5 where appropriate."

He says the ABA will not assign any more broadcasting services on Channel 5A and will clear it eventually, as that part of the band is allocated and required for other services.

Divisional Notes

Forward Bias — News from the VK1 Division

Chris Davis VK1DO

There have been an amazing number of members whom I have spoken to either on the air, face to face, or by phone just lately who have gone out of their way to comment objectively on the excellent content and general interest of AR magazine. While I am personally very pleased to hear such a high level of satisfaction with our member magazine, I hope that members will take the time to go beyond these casual compliments and forward written remarks to the editorial staff.

The role of the editorial staff is often characterised by insufficient objective feedback, too much misdirected complaint from the disgruntled who seem more apt to put pen to paper, and conspicuously absent are enough objective letters indicating obvious satisfaction and identifying the content which has brought acclaim.

To modify an old saying; "Why do the people who say it goes without saying, go without saying it?" Or to work from the other direction; "Why do only the squeaky wheels make the most noise?" To cut the metaphoric nonsense for the moment, how about a brief note along the lines mentioned above? To maintain the exceptional standard of your magazine, positive feedback is vital. Just as vital as the submission of technical articles, historical articles, etc.

After a disappointing turn out for the John Moyle Field day in March of this year, we have taken the initiative and begun stirring up some interest with generous advance notice. This has been positively received with one group well advanced in their preparations for a station at a location never previously used. This is admirable. I hope that their vigour and initiative is infectious upon others. Field operation is an integral part of our hobby and quite frankly, it's easier than ever. Talk to the chaps who took 100 kilo AM transmitters into the field on trailers during the sixties. If you are keen to form a team for a field day and would like assistance in the planning stages, please call out, we would be pleased to give advice and assistance where we can.

This year will be the last year when courses and classes are run under the auspices of Richard VK1RJ and Ted VK1AOP. The number of successful graduates to the on air ranks pays tribute to the meticulous dedication these gentlemen have given to the job. The standard of professionalism will be sadly missed. However, I hope we are able to find sufficient interest from suitably qualified members to fill their shoes for next year?

On the subject of filling positions, etc, now is an excellent time to contemplate standing on next year's committee. Whether you have been licensed for twenty years, or twenty minutes, your input would be invaluable. Each year, our Christmas break and the dreamy weather of January brings us up to the annual general meeting with a blink of the eye. I will be canvassing and lobbying in the next few months, and I am feeling unforgivably ruthless. Why should such a selfish handful have all the fun?

A final reminder of the Canberra Amateur Packet Group's technical symposium to be held this month on Saturday October 30th. The venue is the Southern Cross Primary School in Holt. Further details are available from Gavin Berger VK1EB on 06 258 5390 or Neil Pickford VK1KNP on 06 258 7803 or 06 274 8422.

A trend emerged some years ago for a large number of members to leave the general meetings immediately they ended, and go off to a local coffee shop rather than socialise with the larger population. This astounds me as someone who values the broader social side of our hobby. For a start, the coffee elsewhere is expensive, the service is appalling, and the large egress of members from our meeting room means that the meeting falls apart with undue haste. Also, only a couple of us are left to tidy up!

How about helping to raise the standard of fellowship after meetings, assist with preparation of tea and coffee, and pull up a chair. Breaking off into elitist groups is negative and short sighted. Before long some members will bypass the general meeting and just go to the coffee shop?.

As someone who puts a great deal of effort into organising meeting topics, co-ordinating equipment for meetings, and has spent many years manning the urns and washing up, I find this trend to take what the meeting offers and then to nick off, rather insulting. I doubt that the action is intended maliciously; however, I am very confident that breaking the trend would benefit everyone.

Remember that the November meeting date will take the form of a barbecue down at Weston Park peninsula which is the continuation of Banks Street in Yarralumla. Talk in direction will be available on channel 50, 146.500 MHz. The date for this bring-your-own-everything Xmas event will be Monday November 22nd.

I look forward to seeing you at our October buy and sell, trash and treasure evening being held on Monday, October 25th. Cheers for now.

5/8 Wave — VK5 Notes

Rowland Bruce VK5OU

Apologies to all those readers who suffered withdrawal symptoms as a result of 5/8 Wave not appearing last month. I was on holiday, had my wallet stolen with my list of deadlines in it, and forgot to submit a column.

The August general meeting of the WIA VK5 Division was a buy and sell and Peter Maddern did his usual job of extracting money for junk and also getting the prices for the good stuff. There was some competitive bidding and some "firsts." Craig bought himself a mini ghetto blaster and Andrew VK5EX allowed himself to be pushed beyond the limit and had to wait until some of his gear was sold before he could pay $5.50 for some co-ax, much to the amusement of the unsuccessful bidder, Garry VK5ZK, who was aware of Andrew's financial situation. Thanks Peter, John and Steve for the service you provide on these nights.

A thank you and a congratulation to Ross Dow VK5KF, who notches up his four hundredth relay of the WIA Sunday broadcast about now. Whew! I don't think I've heard that many. Murray VK5ZQ, our BC officer, is having a break from duties at present and we are grateful to Peter VK5TZX for producing the programs from 5th September to 24th October.

Just in case you have missed the corrections which have been put about, the Equipment Supplies Committee telephone number is 08 287 2868. If it is a number you are likely to use, write it down now please. There is one very patient telephone subscriber in Adelaide who has enough of our voices lately. Council has approved the use of the VK5RAD repeater (147.000 MHz) by the Adelaide Hills ARS to run a weekly club net, for a trial period of six months.

Peter Koen has provided me with news of Scout Radio Activities. JOTA weekend, 16th and 17th October, is almost upon us. There are 23 South Australian Scout Leaders who hold call signs and, together with volunteer operators, they should make the Scout voice in this state well heard on those dates. Look out for VK5BPA operating from Naracoorte caves. Also, Scouts will be involved again this year in the Leisure Day in the Park,

which is the previous weekend, and a joint station with the WIA will operate.

Finally this month, a warm welcome (or re-welcome as the case may be,) to WIA ranks to T N Brownlow, F Fish, S Collins and J Bothwell VK5UW. Wish I had forenames to use, rather than initials.

QRM from VK7

Frank Moore VK7ZMF

As it's been some time since there has been news from VK7 in AR we need to go back over last year One of the main highlights was the Abel Tasman Award This was an extremely successful contest with over 150 awards issued. There were many field stations operating from the top of mountains and even at the first landing site of Abel Tasman on the actual anniversary. The award was supported by Tourism Tasmania. Tourism Australia will also be helping by allowing us to place information at most of the tourism gateways into VK7 to inform visitors, licensed and otherwise, of repeater frequencies, contact numbers, broadcast times and other activities.

Two members had the honour of Life Membership bestowed upon them. Joe Gelston VK7JG and Ted Beard VK7EB were made life members in recognition of their many years service to the hobby and the WIA.

The major event in the Southern Branch would have to be the lease of the old OTC VIH Hobart radio site on the Queen's Domain as clubrooms. Following the closure of the site as Hobart Radio, the Branch successfully negotiated a long term lease for the site with the Hobart City Council. The rooms are now being developed and meetings so far have been well attended by members and visitors. It looks like the site will be a major camp for JOTA this year. Keep an eye out for a special callsign to commemorate what was almost 80 years of the site operating as Hobart Radio and a "special" dealing with amateur radio on ABC Radio.

The packet system has had a number of changes thanks to some additional support from AAPRA.

The Northern 70 cm voice repeater VK7RAB is tone linked with the 2m repeater VK7RAF, near Hobart

Targa Tasmania was a major activity for WICEN (Tas) and amateurs from around the state have been complimented on their efficiency You will be able to read more about this in an article to be published soon in AR

All of that and more in this 70th year of the WIA in VK7.

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Wanted — A Divisional Secretary for VK6

The Western Australian Division of the WIA is looking to appoint a Divisional Secretary and is prepared to offer a small honorarium to a suitable applicant, to be remitted annually.

The following lists the duties expected of the Secretary, who need not necessarily be an amateur:

Custody of the Official Telephone and Answering Machine, taking calls, answering where possible, redirecting others.

Hold the Key and Clear the Official Post Office Box, Box 10 West Perth, WA 6782 on a regular basis, listing all mail, and redirecting where necessary (eg Financial or Membership, etc), sending an acknowledgment slip immediately and (until competent) checking with Councillors before sending replies.

Attendance at two Meetings a month, both the Council and General Meetings, for the purpose of recording the minutes, notifying the Members of both Incoming and Outgoing Mail, etc.

Custody of the Filing Cabinet and keeping the contents in order.

Applications in writing to the President, Mr C A Bastin, together with a short resume, to be received by the last post on Friday, 29th October 1993.

WIA News

Amateur Escape Fees, Fight Spectrum Auctions

In a narrow escape, the ARRL managed to save US amateurs millions of dollars a year in "regulatory fees" on all amateurs licensed in the US proposed in the US government's budget considerations in August.

ARRL President George Wilson III W4DYI said, "The regulator fee issue.....is a great victory, since it would have been an administrative nightmare and would have cost radio amateurs millions of dollars a year."

Wilson pointed out that the fee might have had a negative impact on young people just entering the hobby, right when it is enjoying a resurgence among young people."

"A fee might have been a roadblock to that first licence", he said.

The ARRL also managed to convince the government committee to accept provision of the Emerging Telecommunications Technology Act requiring the "input" of amateurs in future reallocation of radio spectrum that might affect amateurs.

The provision will require the Secretary of Commerce to seek to avoid excessive disruption of existing use of shared Federal/ Amateur Radio frequencies, an issue the League had been fighting to win for more than a year.

"It gives us more leverage as the government moves toward the auction of frequencies for commercial development," said ARRL President George Wilson.

"Now we have a stronger say in how these frequencies will be selected."

The Clinton government is trying to raise $US10 billion (almost $15 billion Australian), in a proposed scheme to auction slabs of the radio spectrum.

As reported in the Australian Financial Review of 10 August, some 340 MHz of spectrum is to be opened for commercial use in the US, particularly for "personal communication services" that employ new "wireless" technologies, including radio (spread spectrum), local area networks for computer systems, pocket telephones, pagers etc.

While management and licensing of the radio spectrum in Australia is moving towards a "market based system" under the newly-established Spectrum Management Agency, such an auction system has not been mooted for Australia.

However, the WIA is keeping a close watch on developments.

How's DX

*Stephen Pall VK2PS**

Now that we have passed the September equinox, one hopes that there will be some improvement in the propagation patterns, and the DX bands will become alive again As the present solar cycle still declines towards the bottom, a basic amateur station without an amplifier transmitting an SSB signal is very often difficult copy on the other side of the world However, not everything is lost for those who accept challenges. Have you considered going back to basics? Like going back many years and operating in the CW mode? There is still plenty of good CW DX around on the 20, 30 and 40 metre bands, especially in the afternoon or early in the morning local time.

Here are a few DX prefixes heard lately : 9J2 — ZD8 — YS — PZ — CX2 — FM5 — OA4 — ZA — D68 — YI9 — 9K2 — CN8 — HH — HP — CO — Z31 — 5R8, and of course lots of Europeans, Americans and Japanese. All of them were CW signals.

Yes, I know, some of you are a bit rusty handling CW and there are no "nets" to assist you. But this is the challenge! A little practice with the key can solve your Morse problem and your listening skills and propagation knowledge will overcome the absence of the SSB nets. Remember, also, that a 100 Watt CW transmission is quite a strong signal which will penetrate the QRM and QRN and is useable most times, even in bad conditions. So try a little CW. Good hunting!

Thursday Island — VK4

In the last few months Thursday Island (OC-138) has become the target of the "Island chasers". Rex VK4BRE obliges from time to time to appear on the bands, providing he can find time in his daily busy schedule, being the only baker on the island. Thursday Island — and the other surrounding islands — Friday, Hammond, Horn, Prince of Wales, Sunday, Wednesday and Tuesday — lie in Torres Strait about 40 kilometres north of Cape York, the most northerly part of mainland Australia It has an area of about 2.5 square kilometres and a population of over 2000. The island is the administrative centre of the large island group. It is not certain who named Thursday Island, some believing it to have been Captain Cook, others think it was Lt Phillip Parker King who charted the area in a cutter named "Mermaid" in 1819. European settlement dates back to 1877. Thursday Island with other islands lying within 60 miles of the coast of Queensland was annexed to that colony in 1872.

Recently I received a QSL card from Rex together with some personal details about the life of this most northerly radio amateur in Australia. Rex and his wife Dot, who is a Torres Strait Islander, own and operate the local bakery on Thursday Island and this keeps them very busy. Rex has just upgraded to full call (VK4BRE) and his wife Dot, the only Torres Strait islander to have an amateur licence, is the proud owner of the novice call VK4MME. Their amateur activity is mainly on 2, 15 and 20 metres in the late afternoons or early evenings. They have lived on the island for the past 8 years, arriving in a yacht which they bought in Brisbane and in which they cruised the east coast for seven years. They have four children, aged 5 to 16. Being busy has not stopped both of them from studying for private pilot licences and Rex says that by the time you read these lines he will have passed his final exam. Dot is halfway through her studies. There is no QSL Bureau on Thursday Island so if you require a card from OC-138 send your card with the appropriate reply envelope and return postage to: Rex PO Box 418, Thursday Island, Queensland, 4875, Australia.

160 Metre DX

When Regulation Fifteen of the US Radio Act 1912, shortly after the first World War, had specified that "no private station...shall use a transmitting wavelength exceeding two hundred meters" and when in 1923 the 150 — 220 metre amateur band was created in the US, no one could foresee the rapid development of amateur communications on the short wave bands.

Today, only a very small segment of the medium wave band, which we call the "160 Metre Band", is used by amateurs. Propagation on this band for DX purposes depends very much on the activity of the sun and on the maximum disturbance in the earth's magnetic field as measured by the K Index. It also depends on the time when the sun sets or rises in the respective station locations. Roger VK4YB and Bob VE7BS have conducted propagation experiments on this band for a number of years. Each year during the "southern winter" a small band of 160 metre enthusiasts gather on the 1.832 kHz frequency. Alaska, Canada, the west coast of the US, New Zealand and stations on the east coast of Australia are represented around 1100 UTC.

During the 92 nights of the 1993 "season", which officially ended on the 13th of August, there was a total of 940 check-ins with an average of ten participants per night." *The year has been more difficult than 92 and a lot more difficult than 1991"* Bob wrote in a letter to me. *"Everyone agrees that the best days have been when the K index was high and/or increasing. The best of all has been when a major flare has been spotted but the particles have not yet reached earth. The actual solar flux figure does not seem to matter much"* says Bob.

Transmitting power is not of very great importance. Many VKs made the trip across the Pacific with 100 watts. However, antennas are of great significance and activity in this field gives the average amateur ample room for experimenting with "wires".

Peter I Island — 3Y1

As reported earlier (June 1993 AR) this expedition is still on track for a 16 day operation commencing on the 1st of February 1994. Ten operators will be running four stations on all modes. A deposit payment has been made on the ship. The team leader is Ralph K0IR and they are still looking for one more experienced operator. Donations are very much welcome and should be sent to AA6BB who is also the QSL manager to the group together with KA6V.

Canton Island — T31

Canton Island is in the news again. I reported in October 1992 in AR that some development is planned in the near future on this small coral island in the Pacific. Lately it has been reported that Tek T32LN will be visiting the island several times during the next year. A fishing resort is under construction on Canton Island and it is planned to be open around September 1994. The resort will be managed by Tek T32LN. It is then hoped that DX activity will be more frequent from that island in the distant future. Intending DXers should contemplate using the existing facilities already there. There are two huge log periodic antennas on the island, one facing west the other facing east Both antennas are located on 150 feet tall towers. The coax leading to the antennas is three inches thick! New electronic installations? No! These antennas and towers are the leftovers of the 1960 NASA re-activation of the island They are still in good condition. However, if you are in a hurry and do not wish to use the boat service from Tarawa which has an unpredictable time-table, then the only way to Canton Island is by chartering

an aircraft from Samoa which will set you back by US$5000. Each day for the plane overstay will add a further $1000 to the cost.

Christmas Island — VK9X

Steve VK6VZ advised me that he will be on Christmas Island for a week starting November 6th. He will be on holidays but will try to be active on 20 and 40 metres on both CW and SSB. Time permitting he will visit the Southern Cross and Butterfly nets (14226.5 kHz). QSL direct only to his home call.

Yemen — 4W

It was reported in several DX publications that the planned Yemeni DX expedition will not proceed for the time being. UA4WAE says, quoting KK6H one of the operators who had been scheduled to go on the trip, that the Republic of Yemen will not issue a licence or operating permission to a DX group which includes Americans.

Romeo — 5A0RR

Finally news of Romeo. Here are some of the details of a lengthy news release from Romeo, as received by Ed NT2X and as it appeared on the OPDX/BARF 80 BBS Bulletin in Cleveland, Ohio on August 23rd. Originally Romeo planned a Libyan operation of six operators, but due to lack of funding, only Romeo, Danny LZ2UU and Said (a Libyan who currently holds the callsign 5A0RR) participated in the five days operation, during which they worked 11000 stations. The DXpedition coincided with the International Arab Summit held at that time in Cairo and national security in the region was at a very high level. The expedition was terminated when Romeo and Danny were accused of planning to assassinate President Mubarak of Egypt and President Gaddafi of Libya. They were also accused of using ham radio to cover illegal drug trafficking.

They both ended up in a Libyan jail, and Romeo does not go into details on this subject, except to say that he is now in Moscow under medical care and treatment. The Libyan operator, Said, will continue to operate under the callsign 5A0RR — Romeo left the equipment behind. Said is an excellent CW operator. Copies of the 5A0RR logs are in Bulgaria and QSLs are being sent. Romeo was greatly disturbed about the unwarranted and undeserved criticism about himself, along with false charges, and at the small support he received from the ham community during his ordeal. QSLs to be sent to his well known Bulgarian address, Box 812, Sofia 1000.

Future DX Activity

- Penrhyn Island in the North Cook group is very active. Husband and wife team, Hugh and Aimee, are active as ZK1DT and as ZK1AT and are heard often on the 14247 "net". QSL to Hugh and Aimee Tabique, Penrhyn, North Cook Islands via New Zealand.
- Michael C56/AA7NO, Warren C56/KF7AY and Tony C56/N7BG will operate from Banjul, Gambia before and after the CQ WW SSB contest at the end of October. QSL to home call of each operator.
- The contest station C56V will be heard on Oct 30-31. QSL to KD7E.
- Iran will be active during the whole of October. EX0A/EP, EX0M/EP and 9D8UW will be active, one hopes. At the moment they are still looking for sponsors.
- XX9AS can be heard often on 21177 kHz at 1300 UTC.
- HL93 is a special prefix in celebration of the Taejon International Exposition in Korea. The special EXPO station callsign is 6K93XPO.
- Crozet Island, FT4WD, can be heard on 18 MHz, mostly on weekends. QSL to F6AXX.
- Expect to hear WA4FGY active under the call HS0ZBJ. He is taking up residence in Thailand for an unspecified period.

Interesting QSOs and QSL Information

- 5B4YY — Jeff — 14247 — SSB — 0424 — July — QSL to G4KIB to J L Hambleton, 3 Aldery Close, Glen Parva, Leicester, Leics, LE2 9HY UK.
- D2SA — Chris — 14198 — SSB — 0631 — July — QSL to F6FNU to Antoine Baldeck, Box 14, F-91291, Arpajon, Cedex, France.
- ET3DX — Franz — 14197 — SSB — 0450 — Aug — QSL to JH1AJT to Yasuo Miyazawa, PO Box 8, Asahi-Ku Yokohama 241 Japan.
- T30W — Willy — 21205 — SSB — 0513 — Aug — QSL to AA6BB to Gerald D Branson, 93787 Dorsey Lane, Junction City, OR 97448 USA.
- HH2Z — Jan — 21205 — SSB — 0549 — Aug — QSL to KA9RLJ to Gary F Olson, 1915 10th St, Peru, IL 61354 USA.
- V31ML — Mike — 14243 — SSB — 0430 — Aug — QSL to N5FTR to William M Loeschman, 717 Milton, Angleton, TX 77515 USA.
- VP2M/KM6WF — 14250 — SSB — 0442 — July — QSL to KM6WF to Gayle Olson, 11216 F, Dorland St, Whittier, CA 90606 USA.
- ZA1N — Spiro — 14250 — SSB — 0520 — Aug — QSL to HB9BGN to Albert Muller, im Hubacker, CH — 8311, Bruetten, Switzerland.
- EX0A (formerly UM8) — 14228 — SSB — 0200 — Aug — QSL to DF8WS to Wilhelm Schommer, Merscheidetrweg 37, D-5522, Speicher, Germany

From Here and There and Everywhere

- Do you remember Bing VK2BCH who, some years ago, gave you Rotuma Island as a new DX country? Bing in the past was active under these callsigns: VK9LB — ZK1XV — 5W1GY — ZK3RVC — 3D2XV — and A35XV. One does not hear much of Bing these days. The truth is that Bing was very sick over the past 12 months and he is now recovering slowly. When last on Rotuma he picked up a parasite infection and a fever which he found very difficult to shake off. He is *"feeling much better just lately and I hope to take a trip to Lord Howe Island from the 18th of September to the 18th of October"*. The call will be VK9LB and QSL direct only to the VK2BCH call book address.
- Bill K1SE advised me that he is the QSL Manager for Bob J28BM, Steve VK8SD (his son), and Bill A45ZW in Muscat, who likes to operate RTTY. K1SE just acquired a post office box to handle the QSL cards and he prefers that cards should be sent to the box address: Bill DeLage, PO Box 685, Manassas Park, Virginia, 22111 — 0685, USA.
- Mexican Novice operators are using the XE0 prefix. They are allowed to operate CW from 7000 to 7050 kHz, and LSB from 7050 to 7100 kHz.
- Willy (formerly T30AC) is back in Kiribati with the new callsign T30W.
- Belgian amateurs were using the special prefix of "OO" until the end of September celebrating the accession to the throne of their new King, Albert II.
- Monk Apollo, SV2SAP/A from Mt Athos, was heard on the European DX net talking to Selim, OE6EEG in Greek. The signal was quite strong here in VK. However, he did not respond to any other outside calls.
- Henry T30A (formerly — T30BC) is a silent key as from the 24th of July.
- Richard ZK1XR is on Manihiki Atoll in the North Cook island group making a documentary film. He has electric power only for four hours each night starting from 0500 UTC. Send cards to his home call N7NKG.
- The Spratly Island activity, 9M0S, has been accepted by the ARRL for DXCC credit.

- According to I0IJ and reported in various DX Bulletins, no amateur activity is planned for the SM0M (Sovereign Military Order of Malta) station, with the callsign IA0KM.
- The DXCC backlog at the end of July was 114 applications (16345 QSL cards). Turnaround of the cards is only a few weeks.
- All new applicants for amateur licences in Hong Kong are issued with the VR2 prefix. Old VS6 licences are converted to VR2 upon renewal.
- Peter ZK1XP on North Cook has appointed Jim Smith VK9NS as his QSL Manager.
- It was reported that the well known Finnish DXer, Martti Lane OH2BH will be moving to Hong Kong for the next two years because of business commitments. It is expected that from time to time he will operate for short periods from BV, BY, VS6/VR2, DU, HL, and maybe from P5.
- Nothing further to report on the proposed Pratas Island activity. Some sources say that the hopeful operators are waiting on some action by the Ministry of Communication, others say that the callsign will be BV0ARL/BV9P. Again some weather experts are pointing out that September to November is the typical typhoon season in the South China Sea. An unconfirmed source is suggesting that the operation will be active from 6th October, when a major European operator joins the group. Could it be the well known ....?

QSLs Received

ZL7AA (4M ZL2TT) — J28BM (1M K1SE) — 5X1DX (3M NY3Y) — EP2MHB (4M op) — C91J (8W W8GIO) — 9G1AA (4M PA2FAS).

Thank You

Thanks to all of you who have kept me informed, especially to. VK2BCH — VK2KFU — VK4BRE — VK4YB — VK6VZ — K1SE — VE7BS, and the following publications: QRZ DX, The DX Bulletin and the DX News Sheet.

Good DX and 73.

*PO Box 93 Dural NSW 2158

Repeaters — Additions, Deletions, Alterations. Have you advised the WIA of changes needed to the repeater list?

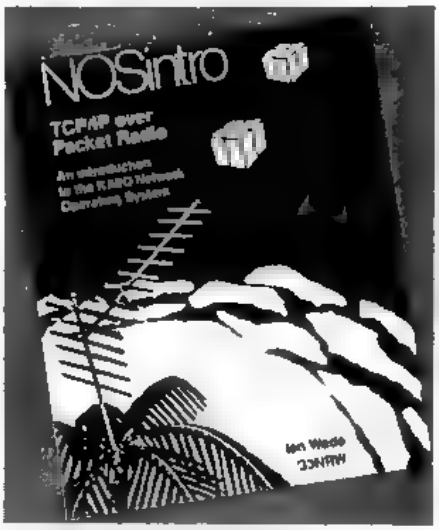
A Packet of Packet

*Warren Toomey VK1XWT**

Well, I'm back after a month's break, caused mainly by work-related activities. Please note my new address. I've had some lost mail troubles recently, caused mainly by an unlocked letterbox and a nearby primary school; hopefully the new address should fix this.

This month's column has another book review, this time of an introductory book about the NOS program, which provides a rich set of applications and protocols for the amateur packet user. My thanks to Marek VK1MK for the loan of his book, and to Jeremy VK1CIA for the review. This is followed up by a pet "dislike" of mine and something that is related to packet radio: why "Baud" does not mean "bits per second".

Overview of NOSintro



NOSintro is a 350 page, soft cover training and resource guide for the packet user interested in the world of TCP/IP and the applications that run on top of it. NOSintro is reasonably up to date (having been published in 1992) and is full of examples, explanations and reasoning for most of the features within NOS. It is based on the PA0GRI 2.0 NOS implementation, and also describes a suite of programs called NOSview which provides on-line help when running NOS.

The book is made up of 35 chapters and investigates most of the basic requirements for a user to configure a NOS packet station. Many of the examples are identical to those required to configure a home system. For the new user this book will provide the essential knowledge required to progress and reduce the requirement to ask simple questions of other users. This training combined with the reference sections will increase the reader's knowledge at a faster rate than without it.

For the expert user the book still has many uses as a reference manual. Even the most knowledgeable NOS user will still learn a lot about NOS with it, even if it is only to find out a simple way of answering a question about NOS that another user has asked.

As a reference book, NOSintro is a excellent guide to operations and capabilities. Tuning and adjustments are all described and their effects identified for the user. The examples are excellent and the numerous diagrams increase the learning speed of what can be a difficult area of understanding.

The book is not restricted to TCP/IP and investigates most of the other protocols used in packet today. There are reviews of AX25, NET/ROM, SMTP, POPmail, and many other protocols and applications.

Many of the features of NOS are based on the Unix environment, to a larger degree than DOS. Features like FTP, Telnet, Ping and Mail are important services to the user and are introduced to the reader with a good degree of background and flexibility.

If the reader is new to the area, I suggest a quick read of the entire book to start, and then an attempt at all of the exercises. With this under the belt, a second and more thorough read of NOSintro will be invaluable.

The book is a highly recommended training guide to all packet users who want to try out NOS, or who are already well versed in it. In fact, I would suggest that NOSintro is essential reading. Without it you will require a larger amount of time to pick up the concepts, and may need a lot of assistance from other users. It is possible to bring up a NOS station by following the book and not requiring external assistance.

The only real problem with the book is that there are so many flavours of NOS available, and the local NOS community may prefer another flavour. I would recommend that a new user use the version described in the book (PA0GRI 2.0m) for initial investigation, and then change to the preferred local flavour when the user is confident with NOS. However, the book's contents are at least 90% applicable to all flavours of NOS, and it is still an excellent resource for all NOS users and should be on all packet users' desks.

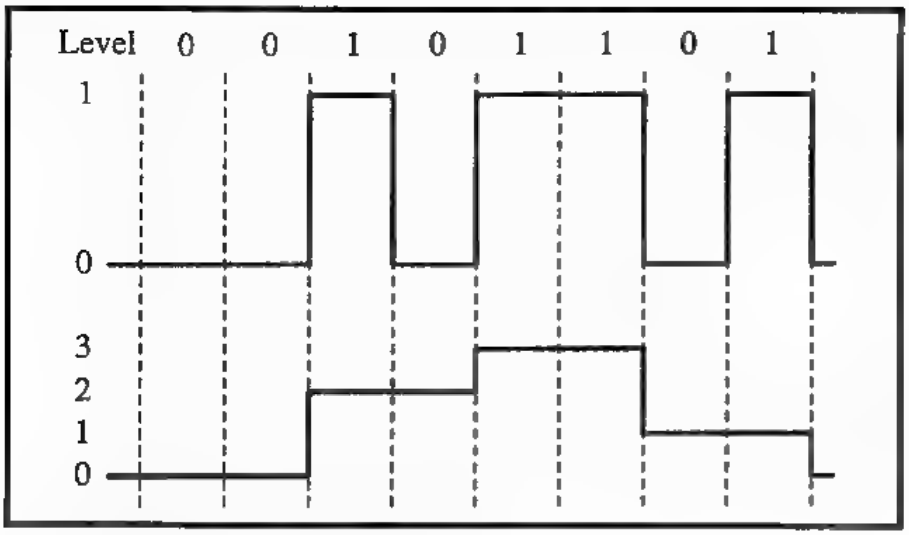


Fig 1 — Data transmission — multiple levels.

The book is probably the best introduction any user could have to the complex world of advanced data communications. I highly recommend you buy the book and enjoy the new world of TCP/IP amateur packet radio.

NOSintro is available in Australia through the Australia Amateur Packet Radio Association (AAPRA). For more details, send a letter to:
AAPRA, 59 Westbrook Avenue, Wahroonga NSW 2076.

To Baud or Not to Baud

We are used to hearing the speed of modems and such being described in terms of "Baud', eg 300 Baud, 1200 Baud, 9600 Baud, but exactly what does it mean? Most people, I suspect, would say that a 300 Baud modem can transmit data at 300 bits per second -- in other words, that "Baud" is a measure of the modem's **bit rate.**

Unfortunately, "Baud" is exactly the wrong word to describe the bit rate of a modem. So why do we use it then?
I'm glad you asked (after all, this column would have been much shorter if you hadn't)! Well, back in the early days of digital communication, Emile Baudot designed a teletype system where characters are sent as groups of 5 bits over some medium (radio, landline), known now as the Baudot system or RTTY. To transmit a character, each of the five bits is transmitted in turn, with the transmitter sending a certain signal (a certain voltage or a certain sine wave frequency) if the bit is a "1', and another if the bit is a "0' Purists please note that I'm ignoring the start/stop bits for simplicity

The Baudot system uses two signal levels to transmit its data, and the signal changes when the bits change. The term **"Baud"** was thus coined to describe the rate at which the **signal** changes, in changes per second. So a Baudot transmission at 50 bits per second is being sent at 50 Baud. Now the Baud rate is useful because it relates to the bandwidth needed to send a transmission: a transmission at B Baud needs at least B/2 Hz of bandwidth. Our 50 Baud transmission needs at least 25 Hz of bandwidth to be sent.

We now have:
Bit rate: The rate at which bits are being transmitted, measured in bits per second.

Signal rate: The rate at which the signal changes, in changes per second or Baud.

But if these are the same, what's the problem?

The problem is that the bit rate and the signal rate are *not always* the same. I've shown that the signal rate indicates the bandwidth needed for transmission In many situations the bandwidth is limited, and this limits the rate at which the signal can be changed, and in turn the bit rate. For example, a standard "phone line has a bandwidth of around 3100 Hz, which limits the signal rate to 6200 Baud in one direction, or 3100 Baud in both (ie full duplex) If there was a way to send more bits for each signal change, we could increase the bit rate without using more bandwidth

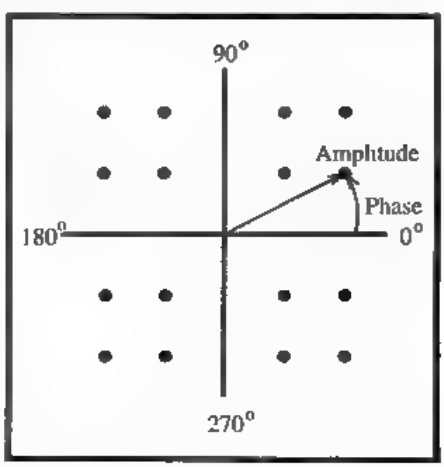


Fig 2 — Amplitude/Phase pairs in V.32.

Fortunately, this is easily done. Instead of using the two-level method as with Baudot, we use more levels to encode more bits. For example, if there are four levels of transmission, we can send two bits for every signal change. Alternatively, eight levels would allow us to send three bits for every signal change. three bits of information can have 2^3 or 8 values, corresponding nicely to our eight levels

An example is shown in Figure 1, where we are sending the bits "00101101'. In a two-level system, each level represents one bit. In the four-level system, each level represents two bits. You can see that the signal only changes half as often in the four-level system, so that if both transmissions were at 1200 bits per second, the top one would be at 1200 Baud and the one below at 600 Baud, thus needing half the bandwidth.

This is exactly the sort of technique used by V.32 9600 "Baud" 'phone modems, which transmit at 9600 bits per second in both directions, and thus would need at least 9600 Hz of bandwidth with a two-level system. A "phone line only provides 3100 Hz of bandwidth, so a sixteen-level system is used. This encodes four bits at a time, which brings the Baud rate in each direction down to 9600/4 = 2400 Baud. Each direction needs 1200 Hz of bandwidth, giving 2400 Hz required overall, which fits into the 3100 Hz provided by the "phone line. A 9600 "Baud" modem, then, is actually a 9600 bps modem, and a 2400 Baud modem.

How each of the levels used are transmitted depends on what method is used to connect the two ends. If a direct connection is used, 16 voltage levels could be used Over a "phone line, some form of frequency, amplitude or phase modulation can be used. In fact, combinations of these modulation techniques can be used For example, the V.32 9600 bps(!) modems use a combination of amplitude and phase modulation, with a particular amplitude/phase pair of the signal (ie the audio frequency carrier) to represent each of the sixteen levels, as shown in Figure 2

So, to conclude, a Baud rate describes the rate at which a signal changes (and implicitly its bandwidth), and is not always related to the data rate in bits per second

See you all again in the next column!

*PO Box 179. Lyneham ACT 2602
VK1XWT@VK1KCM ACT AUS.OC
vk1xwt@minnie.vk1xwt.ampr.org

Pounding Brass

*Stephen P Smith VK2SPS**

Samuel Finley Breese Morse (1791-1872) was born in Charlestown, Massachusetts, the first child to Calvinist Minister Jedidiah Morse and his wife Elizabeth Samuel had two brothers Sydney Edwards and Richard Gary, born some years later

Samuel Morse invented the telegraph, taking advantage of the findings of other experimenters, notably Joseph Henry, who developed the electromagnet. A moderately successful portrait painter and sculpturer, he won the prized gold medal from the "Adelphi Society of Arts" for his sculpture of the "Dying Hercules". Some of his more famous paintings included Congress Hall, otherwise known as the Old House of Representatives, The Louvre and the Lafayette portrait which hangs in New York City Hall

Morse became interested in the concept of the telegraph in 1832 while returning from Europe to America. While he was away from home some years earlier, his first wife Lucretia Pickering Walker died at the age of 25 and it took two weeks for the news to reach him. In the course of a conversation on electricity and electromagnetism with Dr Charles Jackson, on board the packet "SULLY", he conceived the idea of the electric telegraph and said he saw "no reason why intelligence might not be instantaneously transmitted by electricity to any distance".

In 1836 Morse built his first working model, a crude machine fashioned from a picture frame, a printer's point rule and wooden clock parts. The transmitting device consisted of a long, thin, wooden tray called a point rule, which contained notched metal pieces. This was drawn under a set of electrical contacts and, as it moved, would cause the contacts to open and close, thereby alternately opening and completing an electrical circuit.

At the other end of 1700 feet of wire was the receiving unit. It recorded the dot dash type message that was notched in the point rule by writing marks with a pen on to a strip of moving paper. The movement of the pen was controlled by an electromagnet that responded to the electrical impulses passed through the wire, while the paper tape was drawn by a clock mechanism.

Morse used a code book at the transmitting and receiving end. Various codes were used to indicate certain words, names, dates and so on Although this device operated successfully, it had drawbacks.

Alfred Vail became interested in Morse's experiments and was accepted as a 2/16th partner. Vail's family owned the Speedwell Iron Works in Morristown, NJ and it was there that the receiving register and simple hand key were developed to replace Morse's first instruments. Vail also aided substantially in developing Morse's letter code of short and long pulses, or "dots and dashes" which was used in an 1838 demonstration to interested friends and supporters. This code was modified and improved for demonstration to Congress in 1844, and with only minor changes was used in US, Canadian and Mexican landlines until the demise of commercial and railroad telegraphy.

In 1843 Morse obtained a $30,000 grant from Congress to prepare a demonstration telegraph circuit After much difficulty, a circuit was established between the Supreme Court chamber of the Capitol building in Washington and the Baltimore & Ohio Railroad station in Baltimore. On May 24, 1844, Morse and Vail successfully demonstrated the practicality of the invention. Morse had promised Miss Annie Ellsworth, daughter of the patent commissioner (who was a friend of Morse), that if he obtained the grant for the experiment, she would have the honour of composing the first message. She did so, selecting from the Bible, Numbers 23:23 "What Hath God Wrought."

Later that same year, the usefulness of the telegraph was shown when the Democratic National Convention, held at Baltimore, nominated James K Polk for President and the news was flashed to Washington. Very soon newspapers began to include columns of "telegraph news" in their publications.

Associated Press was the first news gathering organisation to lease a private wire from the telegraph company and United Press, International News Service and other wire services followed.

The telegraph receiving register had a moving strip of paper on which short or long marks (dots and dashes) were made by a pen attached to the armature of an electromagnet. The operator transcribed these marks into a written message. Very early, perhaps 1846, operators discovered they could discern letters and numbers from the sounds made by the register. A young man named James Francis Leonard is generally credited with this discovery Writing messages from the sounds instead of transcribing from the tape was at first opposed by telegraph company management (Morse always insisted on calling his invention "the electromagnetic printing telegraph", but it soon became widespread and "sounders" were manufactured beginning in 1856.

Learning to telegraph is not as difficult as it might seem. Just as we learn the shape of letters and numbers in learning to read, telegraphers learn their sounds. Once the alphabet is memorised it only remains to increase speed so that entire words, instead of letters, are heard.

Best wishes, Steve VK2SPS.

PO Box 381 Mona Vale NSW 2103

REPEATER LINK

*Will McGhie VK6UU**

Pagers

Since I last commented about our problems with pagers, little has changed, except that the problem has become worse. More higher powered pagers are going into service every day. It is difficult to find out the effects of pagers on the other side of the continent (the east coast) but, if it is anything like over here in VK6, then the effect is big. Yet another repeater in VK6 is being flattened by a new pager or pagers. The latest to be rendered near useless is VK6RHW some 100 km east of Perth. This repeater is being keyed every 20 or so seconds. The problem is so bad that the repeater is remotely turned off for most of the time. Fixing these problems can be very difficult and time consuming.

The first problem the repeater manager is faced with is to identify the exact nature of the interference. Most likely it is strong signal overload of the repeater receiver. However, the possibility that it may be spurious radiation or mixing between two or more pagers from the pager site, cannot be ruled out. To identify the true nature of the pager interference can take a lot of time.

Most repeaters are a considerable distance from the home of the repeater manager, so finding time to visit the site to work on the pager problem often delays finding a solution. Once on site, about all that can be done initially is install a number of cavity filters in the repeater's receiver to see if the pager interference is eliminated If this works it is receiver overload and a front end cavity filter or two will fix the problem

If the addition of cavity filters does not remove the pager interference, then all sorts of options now have to be tried

None of these options is easy with limited equipment and money. Perhaps the next best option is a very loosely coupled cavity filter or two. The reason is that even two or three normal cavity filters may not be enough to remove the pager signal, which may only be 100 kHz away from your repeater receiver's frequency. At this frequency spacing a normally coupled cavity filter offers only about 2 dB of attenuation to the pager signal. At 500 kHz separation between repeater receiver and pager transmitter about 10 dB of attenuation is normal. With a very loosely coupled cavity filter the Q goes up considerably, and as a result the attenuation of the pager signal.

The accompanying diagram (Fig 1) shows the frequency response of a full size 100 mm (4") diameter cavity filter with very light coupling. Also shown for comparison is a normally coupled cavity filter. The coupling loops are reduced in size, or moved away from the centre tuning element, until 8 dB of insertion loss is produced on the centre pass frequency. Now that is a lot of loss on the frequency that the cavity filter is supposed to pass with almost no attenuation. But, as I have already stated, a normal cavity filter often is just not sharp enough to have any effect on a strong pager signal.

The accompanying drawing shows the dramatic effect of reducing the coupling to the centre tuning element. Now instead of only 10 dB attenuation at 500 kHz, almost 20 dB of attenuation is produced. More importantly the close-in attenuation has increased dramatically from 2 dB to 10 dB for a pager only 200 kHz away. The sacrifice is a greatly increased loss on the desired pass frequency. For use in a repeater, 8 dB of loss in the receiver sensitivity is just not on. However, as a means of localising the pager interference to your repeater, this loosely coupled filter can be very useful. Two of these filters in series produce twice the attenuation. If, after placing two of these cavity filters in series in your repeater receiver, there is still pager interference, then the indications are that it is not your repeater's receiver. Eliminating where the problem is not can reduce the enormity of the problem.

While investigating the frequency response of 8 dB loss cavity filters some interesting things were noticed. Reducing the coupling resulted in less selectivity. This can be explained because there must be a point where further reducing the coupling effectively means no coupling. The filter ceases to be in circuit and has little effect. 8 dB of pass attenuation was about the highest Q; beyond this point the Q went down and the band pass flattened out. Also noticed was the non-symmetrical nature of the response. This is because of the anti-resonant point of the cavity filter is above the centre pass frequency. At this anti-resonant point the attenuation becomes very high, typically 70 dB in a VHF cavity filter. This anti-resonant (parallel resonant) point is typically about 4 MHz higher than the pass frequency. Beyond this anti-resonant frequency the attenuation reduces. The anti-resonant point produces a very deep sharp notch. This notch can be shifted by the addition of an inductor across the in/out ports to bring it closer to the pass frequency. More about this in a further edition of Repeater Link.

The use of a loosely coupled cavity filter is not restricted to a test set up. By placing a low gain pre-amp before the cavity filter, the loss in the filter can be overcome. A 10 d3 pre-amp makes up for the cavity filter loss and the original sensitivity of the repeater receiver is restored. This set up was used at a repeater site in VK6 to cure pager intermod in the repeater receiver. Receiver overload usually doesn't occur in the RF amp but in the first mixer. Provided the RF pre-amp only replaces the loss in signal strength due to the cavity filter, then pager overload can be eliminated from a repeater receiver. The very high Q of a loosely coupled cavity filter or two coupled with a low gain RF pre-amp may fix your pager problem in your repeater receiver. Such a pre-amp could be a grounded gate FET design using a U310.

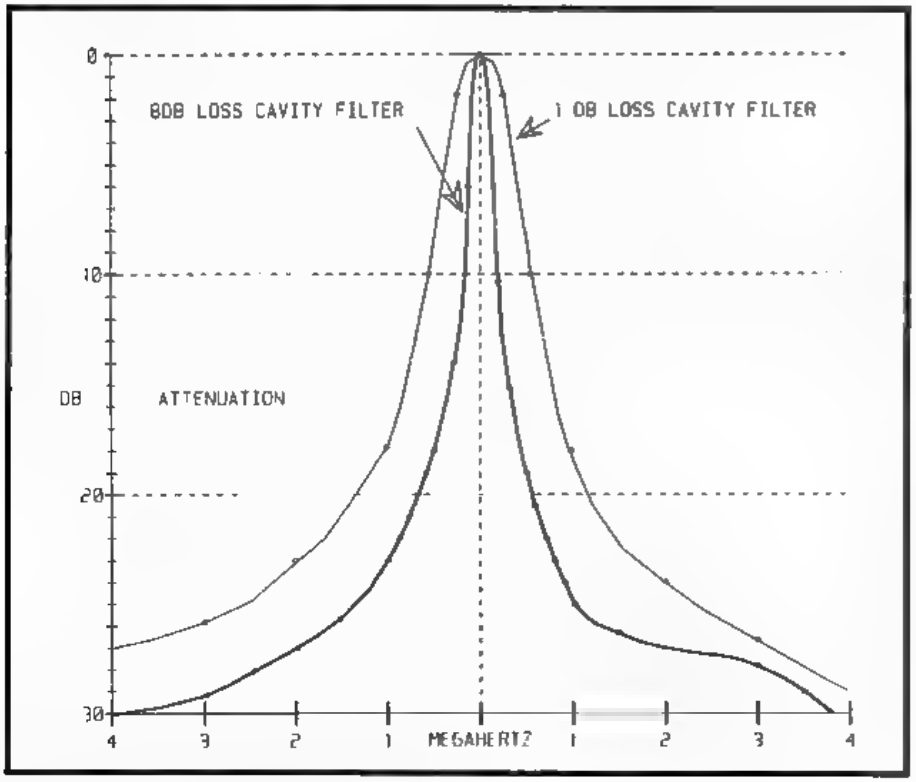


Fig 1 — The frequency response of a full size 100 mm (4") diameter cavity filter with very light coupling.

Pager Speculation

The more I hear about the problems pagers are causing in Australia to amateur repeaters, the more I'm concerned and mystified. How widespread pager interference to our repeater network is can only be guessed at. Is it a big problem or not? Amateurs often operate repeaters in isolation with little or no contact with any other repeater managers. Sometimes problems caused by pagers to a particular repeater continue unreported to other amateurs or the WIA. One such example came to me from VK2. The level of interference and effort put in by the repeater manager were on a scale not yet seen in VK6. The pager interference was a rare (I hope) situation where the problem was not in the amateur repeater, but a combination of pagers mixing in each other's transmitters, and re-radiating an actual signal on an amateur frequency close to a repeater input. The worrying thing about this situation is, that even though every one from Telecom to DOTC to the amateurs involved cooperated in trying to fix a difficult problem, could it just become too hard and too expensive in the future?

Not being one to spread doom and gloom, particularly as the facts on just how bad or not the pager problem is to our repeater network are not yet clear, I'm

hesitant to add speculation about the future. However, that said, times are changing very fast in the communication field. Now that competition is alive and well, can we expect that large amounts of money will be spent to fix up pager problems to our repeater network, even if it is the pagers that are at fault. How, I hear you ask, could pagers be at fault after I have told you so often that it is usually the repeater receiver. Here is a possible example.

Say a pager company installs two or more pager transmitters on the same site. Due to a poor technical choice of frequencies and antenna placement there is a resulting mixing and re-radiation of pager signals on to our 2 metre band. This initially went undetected or unidentified. This type of multi frequency pager installation is repeated on several sites over a considerable area. Even though pager problems were experienced by repeaters in the pager area, the first thought was to blame the repeater receiver rather than pager radiation into our 2 metre band. By the time the true situation was identified, the cost of solving the problem had become considerable. Even though we are in the right to expect the pager company to fix the problem, and efforts were made to remedy the situation, what happens if it is too expensive? Can we expect relatively large amounts of time and money to be spent on fixing a problem that only affects a very small number, perhaps as low as 10? At the political level how would this situation be seen, because this is where it could well end up? In the current commercial struggle between the pager companies, is a political decision likely to be to spend 10's or 100's of thousands of dollars to make a dozen people happy? In particular, people who are on the fringe when it comes to being understood by the majority and probably the politicians as well.

It could all remain hypothetical and never be a problem to the amateur. The pager problem may only be a minor problem and in time technical solutions refined so that our 2 metre band coexists with the pager. The real problem is in finding out just what is happening. Are pagers a big or little problem to amateur repeaters on 2 metres?

To give you some idea of how hard it is to find out information about amateur repeaters in VK6, WARG (The West Australian Repeater Group) sent out letters to all repeater license holders as listed in the call book requesting basic information about their repeater. WARG coordinates repeater management in VK6 on behalf of the WIA and wanted simple information like location, equipment type and repeater manager. This information could then be used to contact directly those involved in repeaters and keep them up to date on current issues. The response, one reply!

What are the experiences of repeater managers in coexisting with pagers? What percentage of repeaters have been affected by pagers, and of that number, how many have found solutions? Some times the few big noisy problems receive all the attention, when the majority have no problem, but go unreported. If there is a big problem with pagers then all amateurs need to know. As a starting point let me know so I can let other amateurs know. Silence can be taken to mean there is no problem.

"21 Waterloo Cr Lesmurdie 6076 VK6UU @VK6BBS

ar

Spotlight On SWLing

Robin L. Harwood VK7RH

Welcome to this month's column. First off, it has been confirmed that Radio St Helena, will be again re-activated this month. Last year this broadcaster, located in the South Atlantic, and perhaps one of the most difficult and rare catches on shortwave, was heard after a long absence. The local station, in co-operation with Scandinavian DXers, arranged for a special one-off transmission, using a spare utility sender. Many listeners around the world did hear this, yet there apparently were some who did miss out.

To overcome this, another special broadcast has been scheduled for the 15th of October between 20 and 23 hours UTC. It will be in English. The frequency will again be 11092 kHz USB but this is only nominal as it did appear to drift around slightly. Also there are a number of close facsimile outlets which caused a little trouble last time around. The address for QSL reports will be given on "Media Network" over Radio Netherlands on October 14th.

On Sunday the 3rd of October, Tasmania will be advancing its clocks for six months to be UTC + 11. The state government has further decided that this will be a permanent feature of the summer months. You may recall that I have been critical, in this column, of Tasmania being out of step with Victoria and NSW for a six week period. This, sadly, will continue as no consensus could be reached between the various administrations. NSW, Victoria and South Australia will be introducing Daylight Saving on Sunday October 31st, for four and a half months. This means that there will be six weeks when Tasmania will be at UTC + 11 and will mean that the popular Tuesday night "Tassie Devil Net on 3.59 MHz will be heard from October 5th at 0900 UTC.

The 48th edition of The World Radio TV Handbook is due to be published in early January. The cost should around $40. As it is usually a while before it's in the local bookstores, several clubs arrange for bulk shipments. Arthur Cushen, who has been writing about shortwave for close on 50 years now, has been acting as an agent for the WRTH and several clubs have obtained their supplies of this and other SWL related publications. Arthur has let me know that he will obtaining both the WRTH plus the 1994 Passport to World Band Radio. The cost for each should be around the figure given earlier. For further details, write to Arthur Cushen MBE, 212 Earn Street, Invercargill NZ.

The other interesting news is that a "Radio Free Somalia" has been logged in Sri Lanka. The status of the station appears to be clandestine. A 100 watt transmitter is reportedly being used between 7460 and 7475 kHz. Times given on "Media Network" were between 0400 and 0515 and 1600 to 1815 UTC. The MN report also stated reports should be sent to Mr Sam Voron, Sydney, Australia. An amateur radio station had also been set up but, in my humble opinion, the legality of the operation is rather questionable as there isn't any recognized Somali administration in existence, outside of the UN peacekeeping troops, to give out licenses.

Now for some snippets. Radio Georgia, in the former USSR, has reportedly been heard in English on 11910 kHz between 0730 and 0800 UTC. No sign of it here, though. Radio Kiribati in the Central Pacific is heard on USB from 0600 to 0800 UTC on 9825. The Khmer Rouge radio station, in or near Cambodia, has been consistently heard on 5408 kHz at 1300 UTC. It is in Khmer but an English segment has been noted. American religious broadcaster, WJCR, recently launched an appeal for funds to erect a tower to broadcast to China. Stating that they were the first to do so for over 40 years, they conveniently over-looked the efforts of Trans World Radio, FEBC, KSDA, etc who have been broadcasting within this region for some time.

Well, that is all for October. If you have any news, please feel free to write to me at 52 Connaught Crescent, West Launceston TAS 7250. I can also be reached by Packet as VK7RH @ VK7BBS.

Until next time, the very best of listening from Robin L Harwood VK7RH ar

Silent Keys

Due to space demands obituaries should be no longer than 200 words.

The WIA regrets to announce the recent passing of:-

R J (Jeff)	WHYTE	VK2AHM
E C (Ernest)	BROWN	VK2AJ
R (Russell)	KING	VK2JS
D J (Desmond)	HAYWARD	VK3BSB
H H (Hugh)	OSMAN	VK5OZ

R J (Jeff) Whyte VK2AHM

Jeff Whyte VK2AHM died 3rd September 1993. He was born in Pt Augusta in 1908 and developed an interest in radio early enough to have a crystal set built in time to hear the first broadcasts from an Adelaide station. However, his early life, which included droving cattle for Sidney Kidman and managing a sheep station, did not leave much time for the pursuit of hobbies.

In 1937, having married and settled on a sheep station, Willow Point, Jeff found the time to obtain his amateur licence.

He became an ardent CW DXer and with 2, 3 or 4 watts worked the world from his shack on the bank of the Great Anabranch of the Darling River. With only limited battery power available he frequently operated by candle light!

After the war he improved the arrangement, but his phone contacts easily recognised him by the thump of the nearby diesel generator.

In 1971 he retired to Wentworth where he continued his active life, as a Rotarian, a shire councillor, the district's historian, a keen golfer and, of course, a radio amateur.

Jeff will be sadly missed by all his family and all the people who knew him through his various activities. He will be particularly missed by those in the local amateur community whom he helped and guided, and those VEs and Gs who regularly communicated with a real gentleman from outback Australia.

Geoff VK3ACZ & Marilyn VK3DMS

E C (Ernie) Brown VK2AJ

Ernest Charles Brown VK2AJ became a silent key on 19th July 1993 in his 80th year. He gained his 2nd class COP during the 1930s, built his own equipment, obtained his amateur licence, and commenced his long radio career.

From 1930 until 1940 he was a corporal in the 55/53 Militia Btl and was engaged in the construction and servicing of military equipment and the training of personnel.

During this period it was permissible to transmit on the broadcast bands after midnight when the regular stations closed. Ernie became involved in the broadcast of request numbers with some assistance from a neighbour who had a phone.

His brother Allan recalls trying to get some sleep one Christmas eve when Ernie had the Salvation Army brass band and choir on the verandah broadcasting carols.

From 1940 until 1945 Ernie chose to join the RAAF rising to the rank of WO. He was engaged in forward operational areas handling sensitive communications for the allied forces.

His knowledge of communications and HF DF working stood by him during his various roles in the DCA Aeradio/Communications organisation from 1945 until retirement in 1974.

Ernie was a well liked, easy going gent who willingly shared his vast knowledge with all and sundry. He will be sadly missed by family, friends and members of the net which bears his name.

D Reynold VK2ANW

Over to You — Members' Opinions

All letters from members will be considered for publication, but must be less than 300 words. The WIA accepts no responsibility for opinions expressed by correspondents.

Z Match Saga

Geoff Combs VK4GWC (OTY Aug) is an optimistic newcomer or a cynical old timer. I suspect the former; who else would predict 1996 for the end of the Z match saga? By the year 1996, Geoff, the Z match speculation will have dragged on for nearly forty years and it will continue as long as writers and readers reject mathematical evidence.

I have a name for technical logic which rejects the aid of mathematics; it is "Paddy Logic". Paddy lost his house keys on his way home from the pub one dark night; he confined his search to the area under street lights because, if he were to find them, that would be the only place he could find them.

The Z match required illumination beyond the limits of verbal speculation. The truth can be told with the aid of a few lines of simple mathematics.

Lindsay Lawless VK3ANJ
Box 760
Lakes Entrance 3909

AR on Tape

In "Over to You" in May, I was most interested to read of the Royal Victorian Institute for the Blind being involved in four track readings of Amateur Radio magazine for the print handicapped.

I would like to add my little bit. Around 1985 the Queensland Tape Service for the Handicapped — all volunteer narrators — obtained copyright permission to produce two track versions with myself at the mike. That went on for some months, until it was realised that there was in fact a four track version available. Because we were duplicating a service (and, of course, using extra cassettes — some nine per issue), the service here was discontinued. However, the school at Narbethong, Buranda Brisbane through their Low Incidence Support Centre of Visual Impairment Services approached me personally to continue. I gladly agreed under the same auspices, that of the QTSH and of course the WIA.

That service started on two track tapes in March 1986 and continued monthly until recently when, sadly, the recipient, Michael Johnston VK4AZR became an SK.

Michael's passing has broken a very pleasant association I have had with AR and, most particularly, Michael. Although I did not meet him in person, he was a delight to talk to by phone. He often expressed his gratitude for this means by which interesting features of AR and his hobby could be passed on to him. The satisfaction he received was evident each time we spoke.

Michael, I know, will be sadly missed at Narbethong, both as a teacher and as a person, and it also leaves somewhat of a void at this address.

At the moment my continued involvement with AR and the Service is in limbo. However, if any further or future need arises, Narbethong will be in touch with either myself personally or more formally with the Queensland Tape Service for the Handicapped and then, depending on the outcome, I will be happy to continue my previous involvement.

Hoping these remarks will be of interest in view of Elizabeth Pennington's letter.

Peter Bauers
27 Hutton Road
Aspley QLD 4034

Torch TVI

I read the letter from Ted VK3ALT in March Amateur Radio magazine concerning interference from re-chargeable torches.

I have seen quite a number of these devices cause trouble and, despite assurances from the manufacturer/importer that the problems would be fixed, I find no evidence that the devices have been altered.

I have only observed the problem on the screen as a single bar of interference about 3-4 cm wide, often nearly white, with scalloped edges about the same width extending out either side of the central interference bar. There is only one bar as the charging circuit used in the torches is only a half wave diode. The interference is generated by the regulator transistor located near the on-off switch. It would appear that many of the transistors are extremely high gain and the layout of the circuitry is such that the device acts as an oscillator tuned to Band III Television (174 — 222 MHz).

I have seen these devices cause interference on any channel between 6 and 10. You can easily determine if one of these devices is causing the trouble by turning the power off, taking care not to disturb the power leads. However, the device may not immediately start causing interference when next turned on. In some cases the interfering signal may show up on another channel altogether, and some torches never cause interference!

On another point, I appreciate the EMC column that appears from time to time and feel that the amateur radio fraternity should read and absorb more of the information available in that column. Our fellow amateurs are often critical of what the anonymous "they" should do. One example is to do with the 148-150 MHz pagers and the problems that they cause some of our amateur 2 metre gear. Although many complain bitterly about the problem very few have bothered to do anything about it by obtaining a suitable filter!!

Cheers for now, and keep up the good work.

Rodney Champness VK3UG
17 Helms Court
Benalla VIC 3672

Callsign Number Plates

Besides amateur radio, one of my other hobbies is collating information on, and collecting, Australian motor vehicle number plates. I understand that only three Australian states issue amateur radio callsign plates. They are VK2, VK3 and VK5.

To assist me in my hobbies, I would appreciate colour photographs or written information on plates that amateurs may have on their vehicles including state, colour, slogan, hyphen position, cost, etc. If many photographs are received, I would like to publish a selection of them in Amateur Radio magazine and also the Number Plate Collectors" Club (Australia) magazine.

Any information on this subject will be most appreciated.

Barrie Lakey VK3BL
18 Raymond Ave
Bendigo VIC 3550

(Several amateurs associated with AR have callsign number plates, and there is a possibility of featuring them on a front cover in the near future. Ed) **ar**

VHF/UHF — An Expanding World

Eric Jamieson VK5LP

All times are UTC

Australian Amateur Bands Beacons

Frequency	Call sign	Location	Grid square	
50.046	VK8AS	Alice Springs	PG66	
50.053	VK3SIX	Hamilton	QF02	
50.056	VK8VF	Darwin	PH57	
50.057	VK7RSB	Hobart	QE37	1
50.057	VK4	Gold Coast ?		2
50.066	VK6RPH	Perth	OF78	
50.0775	VK4BRG	Sarina	QG48	
52.325	VK2RHV	Newcastle	QF57	
52.345	VK4ABP	Longreach	QG26	
52.370	VK7RST	Hobart	QE37	
52.420	VK2RSY	Sydney	QF56	
52.425	VK2RGB	Gunnedah	QF59	
52.440	VK4RTL	Townsville	QH30	
52.445	VK4RIK	Cairns	QH23	
52.445	VK4RBM	MacKay	QG48	
52.450	VK5VF	Mount Lofty	PF95	
52.470	VK7RNT	Launceston	QE38	1
144.022	VK6RBS	Busselton	QF76	
144.400	VK4RBB	Mount Mowbullan	QG62	
144.410	VK1RCC	Canberra	QF44	
144.420	VK2RSY	Sydney	QF56	
144.445	VK4RIK	Cairns	QH23	
144.445	VK4RTL	Townsville	QH30	
144.445	VK4RBM	MacKay	QG48	
144.450	VK5VF	Mount Lofty	PF95	
144.460	VK6RPH	Perth	QF78	1
144.465	VK6RTW	Albany	QF84	
144.470	VK7RMC	Launceston	QE38	
144.480	VK8VF	Darwin	PH57	
144.485	VK8RAS	Alice Springs	PG66	
432.066	VK6RBS	Busselton	QF76	
432.160	VK6RPH	Perth	OF78	1
432.410	VK1RBC	Canberra	QF44	
432.420	VK2RSY	Sydney	QF56	
432.440	VK4RSD	Brisbane	QG62	
432.445	VK4RIK	Cairns	QH23	
432.445	VK4RTL	Townsville	QH30	
432.445	VK4RBM	MacKay	QG48	
432.450	VK3RAI	MacLeod	QF22	
432.450	VK5VF	Mount Lofty	PF95	
432.537	VK3RMB	Mount Bunmyong	QF12	1
1296.198	VK6RBS	Busselton	QF76	
1296.410	VK1RBC	Canberra	QF44	
1296.420	VK2RSY	Sydney	QF56	
1296.440	VK4RSD	Brisbane	QG62	
1296.445	VK4RIK	Cairns	QH23	
1296.450	VK5VF	Mount Lofty	PF95	
1296.480	VK6RPH	Perth	OF78	
2304.445	VK4RIK	Cairns	QH23	
2306.440	VK4RSD	Brisbane	QG62	
10445.000	VK4RIK	Cairns	QH23	

1. Operation of these beacons is doubtful. Any advice please?

2. I have heard that a beacon exists in this area and running FSK?

The Australian beacon list has not been published for some time. There may be others listed which should also be queried. It would be appreciated if beacon custodians could advise the present status of their beacons please.

To VK5 stations the absence of beacons in Melbourne and Mount Gambier is very frustrating as these areas are on the prime route for ducting from Albany. Apart from VK6RTW in Albany on 144 465, stations in VK5 have no beacons by which to monitor the progress of inversions/ducts across the Great Australian Bight or for enhanced conditions between Adelaide and Melbourne.

The value of the reliable Adelaide beacons has been proven time and again The most recent instance occurred during June and July when 144 and 432 MHz opened to Canberra (see report below). On both occasions VK1DO phoned Roger VK5NY to advise that he was hearing the Adelaide beacons, this information leading to contacts.

144 and 432 MHz

Two large inland high pressure systems produced good conditions during June and July. **Roger VK5NY** reports that on 16 June, he received a morning phone call from VK1DO to report reception of the Adelaide beacons on 144 and 432. At 0037 5x2 reports were exchanged with VK1DO (who lives right in Canberra — a very difficult VHF area), 432 was tried but they were unable to make a definite two-way contact. At 0102 Roger worked VK3DUT on 432 and 50 MHz, VK5NC on 432, at 0148 VK1AU 5x2 and 0155 VK3ZQB on 144, VK3AUI on 50, at 0235 VK7KAP in Devonport at 5x5 on 144 and

a scratchy 3x2 on 432, 0315 VK7DC on 432 and four minutes later on 144. The two bands remained opened for most of the day and to some areas the following morning. During the above period, Bill VK5ACY on Kangaroo Island had successful contacts with VK7KAP 5x4 and VK3ZQB 5x5 on 144.

The second occasion was the receipt by **Roger VK5NY** of a 0631 am (local) phone call from **VK1DO** informing him the band was open again on two metres. Soon after a successful 5x2 contact was made. Both VK5ACY and Trevor VK5NC tried to work VK1DO but were unsuccessful.

Roger reported that the latter opening, in particular, appeared to be confined to the inland areas, this being the reason VK5NC and VK5ACY missed out. My proximity to the coast would no doubt have excluded me had I been available.

Six Metres

Ted Collins G4UPS in his July letter reports the following:

- Alan KD4MAE expects to operate on six metres from the US embassy in Saudi Arabia, using the callsign 7Z1AB with an Icom 551D and five element yagi. QSL route is via KN4F and Alan expects to stay two years.
- San Marino was activated with the callsign T70A between July and September. Good conditions on 7/7 allowed many contacts to the UK.
- Seppo OH1VR was active from Market Reef as OJ0/OH1VR and made about 150 six metre contacts with nineteen different countries between 9 and 12/7. Ted says *Market Reef is a small rocky island, situated between Aland Island (OH0) and Sweden. Maximum elevation is one metre above sea level and the island is uninhabited except for a seabird colony. Only buildings are an unattended automated lighthouse and a weather observation station. Seppo had to cut short his reef stay due to high winds requiring him to be removed by helicopter because the scheduled boat could not reach him due to the storms.*
- Macedonia was activated in July for the first time on six metres when a transverter was sent to Z31DX.
- Iceland was activated between 29/7 and 11/8 by an expedition signing TF/G4VXE. The July report also gives a day-by-day coverage of the Es contacts to 21/7. I think Australian amateurs would find it hard to comprehend the degree of activity which is possible from Europe and the UK during strong Es openings. We are well aware of our Australia wide coverage and its extensions which include New Zealand, New Guinea and some of the Pacific island nations. But in Europe there are 50 countries, all within Es range. There must be many areas where six metres is always available via ground wave, tropo, Es and TE, and where the ordinary 200 km distance for six metre working always results in a contact.

To 21 July the following prefixes/countries were worked: 4N1, 4Z4, 5B4, 9A1, 9A2, 9A3, 9H1, 9H5, 9K2, C31, CN8, CQ7, CT0, CT1, CT4, CU1, DJ6, DK5, DL1, DL2, DL7, DL8, EH1, EH2, EH3, EH6, EH7, EH8, EH9, ES1, ES3, EV5D, F1, F5, F6, F8, HB9, HV4, I2, I4, I5, IC8, IK0, IK6, IN7, IO6, IS0, IT9, K1, LA1, LA3, LA5, LA6, LA7, LA8, LA9, LX0, OD5, OE1, OE2, OE5, OE6, OH1, OH2, OH3, OJ0, OK1, OK2, OK8, OM3, OY3, OY9, OZ1, OZ4, OZ5, OZ6, OZ7, PA3, S51, S55, S57, S59, SM0, SM3, SM5, SM7, SP5, SV1, SV5, T70A, TF, VE1, W2, W4, WA1, YL2, YT1, YU1, YU2, YU7, ZB2.

Those 101 prefixes represent 40 countries, not a bad effort for three weeks of work on the band! Where else in the world could you work 40 countries via Es on what is probably the down-side of their summer season. Incredible. Apparently some are becoming tired of having so many stations to work — well, what's wrong with 144, 432 and 1296 MHz?

The July issue of *Six News*, the journal of the UK Six Metre Group, indicates moves are afoot to obtain an increase in power for UK six metre stations, some suggesting that it be 400 watts.

The same issue contains details of a 450 watt solid state six metre amplifier using a pair of BLW96s or MRF448s requiring 50 volts at 20 amps and about 20 watts drive. The author of the article is Chris G3WOS and he includes considerable construction detail. Now that F2 contacts are disappearing, this may be the time for those requiring our 400 watts power limit on six metres to commence building in readiness for Cycle 23.

Also from *Six News* is an item that *SIDC Brussels suggests a first tentative forecast of the timing of the forthcoming cycle minimum as arriving probably between November 1995 and September 1996, which would mean a Cycle 22 length of between 9 and 10 years.*

As a result, everyone can look forward to increased Es availability, especially on two metres. I would like to suggest that we pay more attention to 432 MHz during high Es activity as it is just possible that Es propagation, under certain circumstances, could extend to that band. Some will suggest that any contacts which may eventuate were by means other than Es. This may be true but usually Es precludes working stations at shorter distances whereas tropo often means there are other stations along the same path. Anyway, it's a thought which deserves some attention.

As this issue will appear during the spring equinox it will be interesting to see whether any long distance contacts eventuate. The following month of November should see the start of the usual summer Es activity. I wonder how it will compare with that of Europe?

Closure

Everything must be very quiet as I have found it difficult to assemble much about which to write so rather than babble on I will end now.

Closing with two thoughts for the month:

1. Just when you think you have graduated from the school of experience, someone thinks up a new course; and
2. The younger generation isn't so bad. It's just that they have more critics than models.

73 from The Voice by the Lake.

PO Box 169 Meningie South Australia 5264

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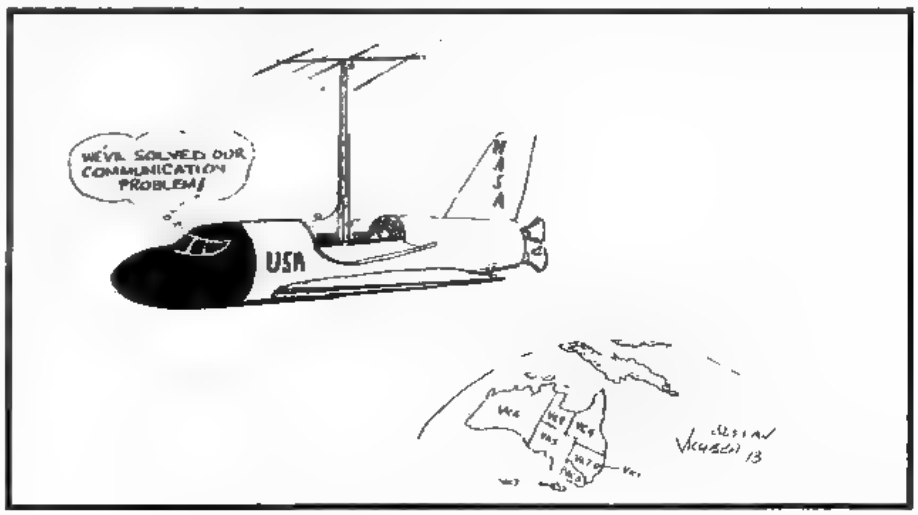

HF PREDICTIONS

Evan Jarman VK3ANI

The Tables Explained

The tables provide estimates of signal strength for each hour of the UTC day for the five bands from 14 to 28 MHz. The UTC hour is the first column, the second column lists the predicted MUF (maximum useable frequency), the third column the signal strength in dB relative to 1 μV (dBU) at the MUF; the fourth column lists the "frequency of optimum travail" (FOT), or the optimum working frequency as it is more generally known.

The signal strengths are all shown in dB relative to a reference of 1 μV in 50 Ohms at the receiver antenna input. The table below relates these figures to the amateur S-point "standard" where S9 is 50 μV at the receiver's input and the S-meter scale is 6 dB per S-point.

μV in 50 ohms	S-points	dB(μV)
50.00	S9	34
25.00	S8	28
12.50	S7	22
6.25	S6	16
3.12	S5	10
1.56	S4	4
0.78	S3	2
0.39	S2	-8
0.20	S1	-14

The tables are generated by the GRAPH-DX program from FT Promotions, assuming 100 W transmitter power output, modest beam antennas (eg three element Yagi or cubical quad) and a short-term forecast of the sunspot number. Actual solar and geomagnetic activity will affect results observed.

The three regions cover stations within the following areas:

VK EAST The major part of NSW and Queensland.

VK SOUTH Southern-NSW, VK3, VK5 and VK7.

VK WEST The south-west of Western Australia.

Likewise, the overseas terminals cover substantial regions (eg "Europe" covers most of Western Europe and the UK).

The sunspot number used in these calculations is 49.6. The predicted values for November and December are 47.2 and 45.1 respectively.

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VK EAST SOUTH PACIFIC

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	30.4	25	25.7	35	37	36	32	28
2	30.6	25	25.5	35	37	36	33	28
3	30.6	25	25.3	37	38	36	33	28
4	30.1	26	24.7	38	39	37	33	28
5	29.2	27	23.7	41	40	38	33	28
6	27.9	28	22.3	45	42	39	33	27
7	26.2	30	20.8	49	44	40	33	25
8	24.5	32	19.5	50	44	38	31	22
9	22.8	33	18.1	49	43	37	28	18
10	21.4	34	17.0	49	41	35	25	14
11	20.5	35	16.2	48	40	33	23	11
12	19.4	36	15.4	47	39	31	20	8
13	18.3	36	14.5	46	37	28	16	3
14	17.3	37	13.8	45	35	25	12	1
15	16.5	38	12.8	44	33	23	9	-5
16	15.1	39	11.7	42	29	18	3	-13
17	13.8	40	10.6	39	25	12	4	22
18	14.5	40	11.0	41	27	15	0	-17
19	18.0	34	13.6	41	34	25	14	1
20	22.9	29	17.7	40	37	32	25	17
21	26.6	27	20.9	38	38	35	30	24
22	28.3	26	22.6	37	37	35	31	26
23	29.0	26	23.6	36	37	35	31	26
24	29.6	25	24.5	35	37	35	32	27

VK EAST MEDITERRANEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	12.1	2	9.2	4	0	-9	-24	
2	12.3	-3	9.3	1	0	-8	-21	-37
3	19.6	2	12.5	-2	3	1	-5	-14
4	23.2	7	17.8	7	5	7	6	1
5	28.5	8	22.3	-13	3	8	10	8
6	28.9	8	23.6	14	3	8	10	9
7	28.1	8	22.8	-13	3	8	10	8
8	26.8	9	21.6	-9	5	9	10	7
9	25.4	10	21.4	-1	9	12	10	6
10	23.8	12	18.9	6	14	14	11	5
11	22.2	14	17.6	15	18	16	10	3
12	20.9	17	16.6	22	21	17	9	0
13	20.1	21	15.9	29	24	18	9	-2
14	19.1	24	15.1	34	26	18	7	-5
15	18.2	25	14.4	34	25	16	4	10
16	17.2	26	13.5	34	24	13	0	-15
17	16.4	27	12.9	33	22	11	-4	-20
18	15.1	28	11.7	31	18	5	11	-30
19	13.8	29	10.8	28	13	-1	-20	
20	14.5	29	11.1	29	15	2	-15	-35
21	17.8	25	14.1	34	25	15	2	-11
22	15.5	23	12.0	25	16	8	-8	-24
23	14.4	18	11.1	18	10	1	13	-30
24	14.4	12	11.1	12	7	0	-13	-29

VK EAST AFRICA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	14.1	10	10.3	10	5	-3	-16	-32
2	13.3	5	10.2	6	3	-3	-16	-31
3	13.7	2	10.5	3	3	-3	-13	-27
4	17.3	5	13.1	9	5	3	-3	-12
5	22.1	6	16.2	-3	8	7	3	-2
6	22.5	8	16.8	-5	6	8	4	-1
7	22.7	8	16.7	-5	5	7	4	-1
8	21.7	6	16.5	-3	6	6	3	-2
9	20.3	7	16.1	1	7	7	2	-5
10	18.7	8	14.7	5	8	6	0	-10
11	17.1	9	13.5	8	8	4	-4	-16
12	15.8	11	12.4	12	9	2	-9	-22
13	14.8	15	11.7	15	9	0	-13	-29
14	14.1	19	11.2	19	9	-1	-17	-35
15	13.6	24	10.7	23	10	-3	-21	...
16	13.2	27	10.2	23	9	-5	-25	...
17	12.8	28	9.5	23	7	-7	-28	...
18	12.2	30	9.1	22	5	-12	-34	..
19	11.8	30	8.6	21	3	-14	-38	..
20	12.4	29	8.5	23	5	-11	-33	..
21	12.0	27	8.3	20	3	-13	-36	..
22	11.6	22	8.1	15	0	-16	-38	..
23	11.4	16	8.1	11	-1	-16	-37	..
24	12.2	11	8.6	10	1	-11	-28	..

VK EAST EUROPE

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	11.1	-2	8.0	2	-3	-14	-30	..
2	10.5	-9	7.7	0	-4	-14	-30	...
3	11.0	-10	8.2	-1	-3	-11	-25	..
4	13.3	-5	9.3	-3	0	-8	-15	-27
5	16.7	0	12.5	-6	1	0	-5	-14
6	19.9	3	15.0	-9	2	3	1	-5
7	22.3	6	16.8	-9	3	6	4	0
8	23.9	8	18.0	-5	6	9	7	3
9	25.0	11	18.9	2	12	13	11	6
10	23.9	14	19.1	12	18	17	13	7
11	22.5	17	17.9	21	22	19	13	5
12	21.2	19	16.9	26	24	19	12	2
13	20.5	21	16.2	31	26	20	11	0
14	19.5	24	15.4	35	27	20	9	-3
15	18.4	25	14.5	35	26	17	5	-8
16	17.3	27	13.6	35	24	14	0	-14
17	16.3	27	12.8	33	22	11	-4	-21
18	14.9	28	11.2	30	17	4	-12	-32
19	13.4	29	10.0	27	11	-3	-23	...
20	13.1	28	9.2	24	7	-9	-31	..
21	12.4	26	8.7	20	3	-13	-37	..
22	12.0	20	8.6	14	0	-15	-38	...
23	11.9	12	8.4	10	-1	-14	-33	..
24	11.8	5	8.3	6	-2	-13	-31	..

VK EAST USA/CARIBBEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	25.4	9	21.4	-3	6	10	9	5
2	22.9	10	18.1	4	11	11	7	1
3	20.1	11	15.9	10	13	10	4	-5
4	18.1	14	14.3	16	14	9	0	-12
5	16.9	18	13.4	21	15	8	-4	-18
6	16.1	21	12.7	25	16	6	-7	-23
7	15.4	24	12.2	28	18	4	-11	-29
8	15.0	26	11.8	28	18	3	-13	-33
9	14.5	27	11.3	28	14	1	-17	-38
10	13.3	29	10.3	25	9	-8	-27	
11	11.8	30	9.1	21	2	-16		
12	12.2	30	9.3	22	4	-13	-37	
13	15.6	27	12.3	31	18	8	-10	-28
14	14.0	27	10.8	26	12	0	19	-39
15	13.6	21	10.5	20	9	-3	-20	
16	15.1	16	11.7	17	11	2	-11	-28
17	13.8	8	10.5	9	4	-4	-17	-33
18	14.2	3	10.8	3	3	-2	-13	-27
19	17.7	4	13.4	-1	4	3	-2	-11
20	22.6	6	17.5	-7	4	7	5	0
21	26.2	7	20.6	-12	3	8	8	5
22	27.8	8	22.2	-13	3	8	9	7
23	28.3	8	23.0	-13	3	8	10	8
24	27.8	8	22.3	-9	5	9	10	7

VK EAST ASIA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	29.7	14	24.8	15	21	22	20	16
2	30.8	14	23.6	13	21	22	21	17
3	31.3	14	24.3	13	21	22	21	17
4	31.6	14	26.1	14	22	23	21	16
5	31.4	14	25.7	16	23	24	22	16
6	30.5	15	24.6	19	24	25	22	16
7	29.2	16	23.5	24	27	26	22	17
8	27.6	17	23.4	31	31	28	22	16
9	26.5	19	21.2	39	35	30	23	15
10	25.1	20	20.0	40	35	29	21	11
11	23.9	21	19.0	41	34	28	18	8
12	23.2	22	18.4	42	34	27	17	6
13	22.1	22	17.5	42	33	25	14	2
14	20.7	23	16.6	40	30	21	9	-4
15	19.2	24	15.1	38	27	17	3	-12
16	18.0	24	14.1	36	24	12	-3	20
17	16.2	25	12.6	32	18	4	-14	-34
18	14.3	26	11.1	27	9	-7	-30	
19	13.5	26	10.5	24	4	-14	-39	
20	13.3	26	10.2	22	2	17	..	
21	19.0	20	15.0	31	23	13	0	-15
22	27.1	16	21.1	28	28	26	20	13
23	29.0	15	23.2	22	26	25	21	16
24	29.1	14	23.7	17	23	23	20	15

VK EAST EUROPE L/P

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	12.3	1	8.2	4	0	-8	-19	-35
2	12.2	4	8.3	6	1	-7	-21	-38
3	12.0	7	8.2	8	1	-9	-24	...
4	11.4	11	8.0	9	0	-12	-30	.
5	10.9	15	7.7	10	-2	-17	-38	.
6	11.4	20	8.2	14	0	-15	-36	..
7	13.7	24	10.0	23	10	-1	-19	-38
8	17.2	22	12.6	29	20	11	-1	-15
9	14.9	21	11.4	21	14	6	-6	-20
10	14.6	14	11.1	14	10	4	-7	-20
11	15.6	7	12.3	6	7	2	-6	-17
12	14.9	1	11.7	0	3	0	-8	-18
13	14.3	-4	11.3	-4	0	-2	-9	-18
14	13.9	-9	10.8	7	-1	-3	-9	-19
15	13.4	-12	10.4	-9	-2	-3	-9	-19
16	12.7	-16	9.8	-9	-2	-4	-10	-20
17	12.3	-18	9.3	-8	-2	-4	-11	-21
18	13.1	-14	9.9	-9	-2	-4	-10	-19
19	15.5	-7	12.2	12	-2	1	-8	13
20	18.5	0	12.6	-13	-1	0	2	7
21	16.3	2	11.0	-8	0	0	-5	-13
22	14.6	-3	9.9	-4	0	2	-9	-19
23	13.5	-2	9.1	-1	1	-3	12	24
24	12.8	0	8.6	2	1	-5	-16	-30

VK SOUTH AFRICA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	14.0	16	10.3	15	8	0	15	32
2	14.6	12	11.1	12	8	0	12	27
3	18.2	12	14.4	11	12	8	0	-9
4	22.4	10	16.5	6	12	11	7	0
5	23.4	9	17.2	2	10	10	7	1
6	23.5	8	17.1	0	9	10	7	1
7	23.2	8	16.8	0	8	9	6	1
8	22.7	8	16.2	0	8	9	5	0
9	21.9	8	15.5	2	9	9	5	-2
10	20.6	9	14.4	5	11	9	3	-4
11	18.9	11	13.1	10	11	8	0	-10
12	17.1	12	11.9	13	11	5	-5	-17
13	15.6	14	10.8	16	10	2	-10	-25
14	14.5	16	10.0	19	10	1	-17	-35
15	13.8	24	9.5	23	10	-3	22	
16	13.2	26	9.0	23	8	7	27	
17	12.8	28	8.8	23	6	-9	-31	
18	12.4	29	8.7	22	4	-12	-35	
19	12.0	30	8.6	21	2	15	39	
20	12.1	29	8.7	21	3	14	-38	
21	12.8	29	8.9	24	7	-9	-31	
22	12.3	25	8.7	20	4	12	34	
23	12.2	21	8.8	16	2	12	-33	
24	13.1	18	9.5	16	5	7	-25	

VK SOUTH ASIA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	23.3	12	16.9	10	15	14	9	2
2	23.5	11	19.5	8	14	14	9	3
3	23.8	11	20.1	7	14	14	10	3
4	23.7	11	19.8	8	14	14	10	3
5	23.6	12	19.5	9	15	14	10	3
6	23.3	12	19.1	12	16	15	10	3
7	22.7	14	18.4	16	18	16	10	1
8	21.6	15	17.3	22	21	16	8	-1
9	20.2	20	16.1	32	25	17	6	-5
10	18.7	22	14.8	34	24	14	0	-15
11	17.3	23	13.7	32	20	8	-7	-25
12	16.1	24	12.7	30	16	2	-16	-37
13	15.3	24	12.1	26	12	-2	-23	...
14	14.6	25	11.5	26	9	-7	-30	...
15	14.0	25	11.1	24	6	-11	-36	...
16	13.5	25	10.6	22	2	-16	...	...
17	13.1	25	10.2	20	0	-20	...	...
18	12.3	26	9.5	16	-7	-29	...	...
19	11.6	26	8.9	12	-13	-36	...	...
20	11.9	25	9.1	12	-13	-37	...	...
21	14.8	22	11.2	24	9	-5	-28	...
22	18.5	18	14.2	21	16	9	-2	-16
23	21.3	13	16.7	17	17	14	6	-3
24	22.7	12	18.1	13	16	14	9	1

VK SOUTH USA/CARIBBEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	26.6	10	19.9	-3	8	11	11	8
2	24.7	11	19.6	3	12	13	10	5
3	21.7	12	17.2	11	15	13	8	0
4	19.6	15	15.5	17	16	12	4	-5
5	18.4	18	14.6	22	18	12	2	-10
6	17.5	21	13.8	26	19	11	-1	-15
7	16.6	24	13.2	30	20	10	-4	-20
8	16.1	26	12.6	31	19	8	-7	-24
9	15.4	27	12.0	30	18	5	-11	-29
10	13.9	28	10.8	27	12	-1	-21	...
11	12.1	30	9.3	22	4	-13	-37	...
12	12.4	30	9.5	23	5	-11	-34	...
13	15.3	27	12.1	31	18	5	-11	-29
14	14.8	25	11.5	27	15	3	14	-33
15	14.3	20	11.1	21	11	0	-16	-34
16	13.6	13	10.4	12	5	-4	-19	-37
17	13.0	5	9.9	6	2	-6	-20	-37
18	13.8	1	10.4	1	2	-4	-14	-28
19	16.6	2	13.0	-2	3	1	-5	-15
20	20.4	4	15.6	-6	3	4	2	-4
21	23.6	6	18.3	-12	2	6	5	2
22	25.4	7	20.2	-14	2	6	7	4
23	26.2	7	21.3	-13	2	7	6	5
24	26.4	8	21.9	-10	4	9	9	6

VK WEST EUROPE L/P

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	11.1	-13	7.7	-3	-5	-11	24	39
2	10.9	-10	7.7	-2	-5	-13	-27	..
3	10.6	-7	7.5	-1	-6	16	-31	..
4	10.2	-4	7.3	0	-6	-19	37	..
5	9.7	1	7.1	0	-10	-24	..	..
6	10.2	5	7.5	3	-9	24	..	..
7	12.0	11	9.0	9	-2	-14	-33	..
8	14.7	14	11.0	15	7	-2	-16	-33
9	17.6	15	13.2	20	14	7	-4	-17
10	18.1	16	12.6	21	16	10	0	10
11	14.3	12	11.0	12	7	-1	-14	-28
12	13.2	5	10.2	6	2	-5	-17	-32
13	14.4	1	9.7	1	1	-3	-13	25
14	13.8	-5	9.2	-4	-1	-5	-14	-25
15	13.2	-11	9.0	-8	-3	-8	-14	-24
16	12.7	-16	8.6	-10	-4	-7	-14	-24
17	12.3	-19	8.5	-10	-5	-7	-14	-24
18	11.9	-21	8.3	-10	-5	-7	-14	-25
19	11.7	-22	8.3	-10	-5	-7	-15	-25
20	12.5	-19	9.0	-11	-5	-7	-13	-23
21	14.5	-12	9.7	-13	-5	-5	-11	-19
22	13.1	-15	9.2	-10	-5	-7	-13	-23
23	12.2	-16	8.5	-8	-4	-5	-16	-26
24	11.5	-15	8.0	-5	-4	-10	-20	-33

VK SOUTH EUROPE L/P

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	11.5	-2	7.9	2	-2	-11	-25	...
2	11.4	1	7.8	4	-2	-12	-29	...
3	11.1	5	7.6	5	-3	-15	-34	...
4	10.6	9	7.6	6	-5	-20	...	...
5	10.1	13	7.3	6	-9	-26	...	...
6	10.8	18	7.6	9	-7	-24	...	...
7	12.6	23	9.3	18	3	-11	-32	...
8	15.9	22	11.6	26	15	4	-11	-28
9	17.1	21	11.9	27	19	10	-1	-15
10	13.5	17	10.5	17	9	-2	-17	-36
11	13.1	12	10.0	11	5	-4	-16	-35
12	13.9	6	9.6	6	4	-2	-14	-28
13	13.3	-1	9.3	0	1	-4	-14	-27
14	12.9	-7	8.9	-3	-1	-5	-14	-25
15	12.5	-12	8.7	-5	-2	-5	-13	-25
16	12.0	-16	8.5	-6	-2	-5	-13	-24
17	11.9	-18	8.5	-7	-2	-5	-13	-24
18	12.7	-15	9.3	-9	-2	-4	-11	-21
19	14.7	-10	10.0	-11	-3	-3	-7	-15
20	17.2	-4	12.0	-13	-2	-1	-4	-11
21	15.1	-7	10.5	-10	-2	-2	-6	-16
22	13.6	-9	9.5	-6	-1	-4	-11	-22
23	12.7	-7	8.7	-3	-1	-6	-15	-28
24	12.0	-6	8.2	0	-1	-8	-20	-35

VK WEST AFRICA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	13.1	20	10.0	18	6	-6	-25	...
2	13.9	16	10.6	16	8	-1	-16	-34
3	17.6	14	13.9	15	14	8	-1	-13
4	22.6	12	17.7	11	15	13	8	0
5	24.0	10	18.0	7	13	13	9	2
6	23.9	9	20.0	4	11	11	8	2
7	23.8	9	19.7	3	10	11	7	1
8	23.5	9	19.2	3	10	10	7	1
9	22.9	9	18.5	4	11	10	6	0
10	21.9	9	17.5	6	11	10	5	-2
11	20.5	11	17.4	11	13	10	3	-5
12	18.8	13	14.9	15	14	9	0	-11
13	17.2	16	13.8	16	14	7	-4	-16
14	15.9	20	12.5	23	14	4	-10	-26
15	14.9	24	11.6	28	14	2	-15	-34
16	14.2	26	11.2	28	12	-1	-20	...
17	13.7	28	10.8	28	11	-4	-24	...
18	13.3	29	10.4	28	9	-6	-27	...
19	12.9	30	10.0	25	7	-9	-31	...
20	12.3	30	9.6	23	4	-13	-37	...
21	11.9	31	9.1	21	2	-16	...	...
22	12.8	30	9.6	24	7	-9	-32	...
23	13.0	29	10.0	26	8	-7	-29	...
24	12.3	24	9.4	19	4	-11	-33	...

VK WEST SOUTH PACIFIC

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	25.3	12	20.6	13	18	17	13	7
2	25.6	12	21.2	13	19	17	13	7
3	25.8	12	19.3	14	19	18	14	7
4	25.7	13	21.5	15	20	18	14	8
5	25.6	14	21.1	16	21	20	15	8
6	25.2	15	20.6	23	24	21	16	8
7	24.4	17	19.5	29	27	23	16	8
8	22.9	20	18.1	34	29	24	15	8
9	21.1	23	16.7	36	30	22	11	0
10	19.4	24	15.4	36	28	19	7	-7
11	18.0	26	14.2	37	26	15	1	-13
12	17.0	27	13.5	36	24	12	-3	-19
13	16.1	28	12.7	34	21	9	-7	-26
14	15.3	29	12.1	33	19	6	-12	-31
15	14.8	29	11.7	31	17	3	-15	-36
16	14.4	30	11.2	30	15	1	-18	..
17	13.6	32	10.3	29	13	-2	-22	..
18	13.1	31	10.0	27	10	-5	-27	..
19	12.7	27	9.7	23	7	-8	-30	..
20	13.6	22	10.3	20	9	-4	-22	..
21	16.2	17	12.8	20	14	5	-7	-23
22	19.9	15	15.2	18	17	13	4	-5
23	22.8	14	17.8	16	18	16	10	2
24	24.5	13	19.5	14	18	17	12	5

VK SOUTH SOUTH PACIFIC

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	21.0	16	17.4	22	20	15	6	-5
2	21.1	16	17.9	22	21	15	6	-4
3	21.1	16	17.7	23	21	16	6	-4
4	21.0	17	17.4	25	22	16	7	-5
5	20.7	18	17.0	27	23	17	6	-6
6	20.2	20	16.3	31	25	17	5	-8
7	19.3	23	15.4	36	28	16	3	-12
8	18.0	25	14.2	38	24	13	-2	-19
9	16.6	28	13.1	34	20	7	-10	-30
10	15.2	28	12.1	32	16	0	-20	...
11	14.1	29	11.1	28	10	-6	-30	...
12	13.3	30	10.5	26	6	-12	-38	...
13	12.7	30	10.0	23	2	-17	...	...
14	12.2	31	9.7	21	-1	-22	...	...
15	11.8	31	9.3	20	-3	-25	...	...
16	11.3	33	8.7	18	-6	-30	...	...
17	10.9	32	8.4	14	-12	-37	...	...
18	10.5	32	8.0	12	-16	...	...	...
19	11.2	25	8.5	13	-9	-31	...	...
20	13.2	20	9.9	17	3	-12	-35	...
21	16.2	18	12.4	21	13	2	-13	-31
22	18.6	17	14.5	22	18	10	-1	-16
23	20.0	16	16.0	22	19	13	3	-9
24	20.8	16	16.9	22	20	15	5	-6

VK WEST ASIA

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	27.8	15	22.1	18	23	22	18	13
2	27.9	14	22.7	18	21	21	18	13
3	28.4	14	23.5	14	20	21	18	14
4	29.3	14	22.4	13	21	21	19	15
5	29.8	14	24.7	14	21	22	20	16
6	29.8	14	24.6	16	22	23	21	16
7	29.5	15	24.1	19	24	24	21	17
8	28.6	16	23.3	23	26	25	21	16
9	27.4	17	22.0	30	30	27	22	15
10	26.0	20	21.8	42	36	31	23	14
11	24.5	21	19.6	43	36	29	20	10
12	23.1	22	18.3	42	34	27	18	8
13	21.9	22	17.4	41	32	24	13	0
14	21.1	22	16.7	41	31	22	10	-3
15	20.1	23	16.9	39	29	19	6	-8
16	18.9	23	15.1	37	26	15	0	-16
17	17.8	23	14.0	35	22	10	-6	-24
18	16.8	24	13.1	33	19	5	-12	-33
19	15.3	24	11.9	29	12	-3	-25	...
20	13.5	25	10.5	21	0	-19	...	...
21	13.2	25	10.1	20	-2	-23	...	...
22	17.9	22	14.1	32	21	10	-6	-23
23	22.9	16	17.7	26	24	20	12	2
24	26.3	15	20.8	22	24	22	18	11

VK WEST MEDITERRANEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	11.2	13	8.6	8	-6	-22	..	..
2	11.3	5	8.6	5	-5	-16	-39	..
3	15.4	7	12.2	6	5	-1	-12	-26
4	21.7	9	16.7	3	10	9	4	-2
5	25.3	9	19.2	-2	8	11	9	5
6	25.4	8	21.2	-5	7	9	8	4
7	25.4	8	21.0	-6	8	9	8	4
8	25.1	8	20.5	-6	8	9	8	4
9	24.4	8	19.8	-4	7	9	7	3
10	23.3	9	18.7	0	9	10	7	1
11	22.0	11	18.6	7	12	11	6	0
12	20.5	13	16.3	15	16	12	5	-4
13	19.0	17	15.1	23	19	12	2	-9
14	17.8	22	14.1	30	21	12	-1	-16
15	17.0	23	13.5	31	20	9	-5	-21
16	16.2	25	12.8	31	18	7	-9	-27
17	15.6	26	12.4	30	17	4	-13	-32
18	14.9	26	11.7	29	14	1	-18	-38
19	14.3	27	11.2	27	12	-2	-22	..
20	13.3	27	10.3	24	7	-9	-31	..
21	12.4	28	9.8	21	2	-16	..	..
22	13.1	28	10.0	23	6	-10	-33	..
23	14.4	26	11.2	27	13	-1	-20	..
24	13.5	22	10.4	20	6	-7	-27	..

VK SOUTH MEDITERRANEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	12.2	8	9.4	7	0	-10	-26	..
2	12.3	0	9.4	3	0	-8	-22	-39
3	17.0	5	13.4	0	5	2	-4	-14
4	24.1	8	18.6	-5	6	9	7	3
5	25.8	7	21.6	-11	3	8	8	5
6	25.7	7	21.3	-13	2	7	7	5
7	25.4	7	20.7	-13	2	6	7	4
8	24.7	7	20.0	-11	3	7	7	3
9	23.6	7	18.9	-7	5	8	6	2
10	22.1	9	17.5	0	9	9	6	0
11	20.3	11	16.0	8	12	10	4	-3
12	18.6	14	14.7	16	15	10	1	-8
13	17.1	18	13.5	22	17	9	-3	16
14	16.1	23	12.7	28	18	7	-7	-24
15	15.4	25	12.2	29	16	5	-11	-30
16	14.9	26	11.7	28	15	2	15	34
17	14.4	27	11.3	28	14	0	-18	-39
18	14.0	28	10.9	27	12	-2	21	..
19	13.3	26	10.2	25	9	-6	-27	..
20	12.9	29	9.8	24	6	-9	-32	..
21	13.7	28	10.4	26	11	-3	-24	..
22	15.9	25	12.2	29	19	8	-6	-23
23	15.6	21	12.0	24	16	6	-7	-23
24	14.9	16	11.5	17	10	1	-12	-28

VK WEST EUROPE

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	12.4	14	8.7	11	0	-13	-33	...
2	11.7	5	8.3	5	-3	-15	-34	...
3	12.2	0	8.6	2	-2	-12	-27	...
4	15.1	2	10.1	0	2	-2	-12	-25
5	19.3	4	14.1	-3	4	4	-1	-8
6	23.2	6	17.0	-8	4	8	5	0
7	25.6	7	18.8	-10	3	7	7	4
8	27.2	7	20.0	-11	4	8	9	6
9	27.2	8	20.8	-9	5	9	10	7
10	25.9	9	20.8	-4	8	10	10	6
11	24.5	11	20.6	4	12	13	10	5
12	22.9	13	18.2	14	17	15	11	4
13	21.4	17	17.0	23	21	17	10	0
14	20.1	20	16.0	30	24	18	8	-3
15	19.3	23	15.3	34	26	17	6	-6
16	18.4	24	14.6	34	25	16	3	11
17	17.5	25	14.0	34	23	13	0	-16
18	16.7	26	12.2	33	21	10	-5	-21
19	15.9	26	10.9	31	18	6	10	-29
20	14.7	26	10.0	28	13	0	-18	-39
21	13.5	26	9.5	25	9	-6	-26	..
22	13.4	27	9.2	24	7	-8	-30	..
23	13.4	26	9.1	24	7	-8	-30	..
24	13.1	21	9.0	18	4	-10	-30	..

VK WEST USA/CARIBBEAN

UTC	MUF	dBU	FOT	14.2	18.1	21.2	24.9	28.5
1	28.1	8	21.0	-12	4	8	8	5
2	22.6	8	17.9	-8	6	8	7	2
3	19.8	8	15.7	0	8	8	4	-3
4	17.8	10	14.1	8	10	7	1	-8
5	16.6	12	13.1	11	11	7	-2	-13
6	15.8	16	12.5	16	13	6	-5	-18
7	15.0	20	11.9	21	14	5	-8	-24
8	14.8	24	11.6	25	15	5	-10	-28
9	14.3	27	11.1	28	15	3	-14	-33
10	13.2	30	10.2	26	12	2	-22	..
11	11.9	32	9.1	23	6	-11	-34	..
12	12.3	32	9.4	25	8	-8	-30	..
13	15.7	29	12.4	33	21	10	-6	23
14	15.7	29	12.4	33	21	10	-5	-22
15	15.1	24	11.7	26	17	7	-7	-24
16	14.1	19	10.9	19	12	3	11	27
17	14.4	13	11.2	13	9	2	-10	-25
18	13.6	8	10.4	7	5	-1	-13	27
19	13.0	1	9.9	2	2	3	13	27
20	13.8	3	10.5	-2	2	1	-9	-21
21	16.6	0	13.1	-7	2	2	-2	-10
22	20.5	4	15.7	13	1	4	3	1
23	23.5	6	18.4	-16	0	5	6	3
24	25.2	8	20.1	-16	1	6	8	5

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● WEATHER FAX programs for IBM XT/ATs *** "RADFAX2" $35-00, is a high resolution shortwave weatherfax, morse and RTTY receiving program Suitable for CGA, EGA, VGA and Hercules cards (state which) Needs SSB HF radio and RADFAX decoder *** "SATFAX" $45-00, is a NOAA, Meteor and GMS weather satellite picture receiving program Needs EGA or VGA & WEATHER FAX PC card, + 137 MHz Receiver. *** "MAXISAT" $75-00 is similar to SATFAX but needs 2 MB of expanded memory (EMS 3.6 or 4.0) and 1024 x 768 SVGA card. All programs are on 5.25" or 3.5" disks (state which) plus documentation, add $3-00 postage. ONLY from M Delahuntly 42 Villiers St, New Farm QLD 4005. Ph (07) 358 2785

● MASSIVE PRICE REDUCTION. Andrew type 43716 right angle N plug silver plated, super price only $30.00 each suitable for LDF 4-50 cable, Andrew type L45R 7/8" EIA flange connector super price only $27.00 each suitable for LDF 5-50 cable, Limited quantities Model VC50 cable power divider 50OHMS 400-520MHz cable assembly fitted with N connectors only $40.00 each, UHF antenna stainless steel 15 element 500-520MHz Don't pay $350.00 only $115.00 each Brand New, including brace kit, 7/8" Cellflex cable only $12.00/metre Coax crimping tool for RG58, RG59, RG62 and pins $16.95 each, save $20.00 Please allow for postage and packing. Jim Rogers, 11 Montrea Ave. Killara NSW 2071 Phone (02) 418 1265 Fax (02) 498 4466.

FOR SALE NSW

● SHACKOUT KENWOOD TS-930S $1500; TS-440S $1500, TS-600 $500, TS-700SP $500; TS-811A $900 TR-7800 $300; TR-9750 $550; TH-21 $100, TR-3500 $200; TL-922 $2000; YK88S/SN $50ea, SW-200 $100, SW-2000 $200 JR-599 $160 COLLINS Equipment KWM-380 $1600, KWM-2A $800; 75S-1 $500; 32S-1 $600, ROTATORS KR-500V $300; CT-1000 $500 ATV TX $200, 1KW LP FIL $45, 2M 100W LIN $120 F/PATCH $30, TNC-2 $150 Plus more all with serial numbers. Sandy VK2AD QTHR (02) 488 9999.

● GALAXY 3 xcvr complete needs slight repair mic manual spare finals $60. Bonus heavy duty power supply Max VK2GE QTHR (065) 85 5732

● 572-B (3) G.C swap for pair new 6146, 813 $25, 4CX250 VHF-PA $50, 829-B $25, SSB 40-CH 11m xcvr swap for rotator HY-GAIN TH2 MKII Yagi $100; OLD telephones/meters Pye 5Q pre-war tx Neville VK2QF QTHR (063) 73 8624

● COLLINS 30L-1 linear exc condition manual uses 811A valves $900. David VK2OC QTHR (069) 48 5267 after 8pm.

● PORTABLE packet! complete setup including Epson laptop pc with 20mb hard disk. BAYCOM modems and software, KENWOOD TH21 hand held transceiver and Brother HR-5 battery operated printer, all in good order $750.00. Horst VK2HL QTHR (02) 971 9795.

● DECEASED ESTATE VK2CDM KENWOOD TS520 spare finals and driver, DC leads, hand mic, head set, owners manual, KENWOOD AT200 $750 the lot; BC348R Receiver (working) Cir Dia (Offers). Tony VK2CAM (02) 638 3569.

● DECEASED ESTATE VK2YC KENWOOD 120 ATU $120; KENWOOD MC-65 desk mic $120; KENWOOD PC1 phone patch $140, KENWOOD HF whips with bumper mount $150, TWO SIEMENS M-100 teleprinters $25 each. Tony VK2CAM (02) 638 3569.

● YAESU FT101ZD hand mic, mint condition, spare finals and driver $750; YAESU HF whips 2 mtrs to 80, gutter mount $120; HUSTLER HF whips, tow bar mount and 54" mast $135; TWO 6146B's with driver $120. Tony VK2CAM QTHR (02) 638 3569.

● KENWOOD TS820, hand mic, manuals $800. Ron VK2VND QTHR (02) 871 5127

● TWO NEC TR-400 UHF duplex base stations on 400 MHz, 8 cavity duplexers, xtal ovens, 10 watts, ideal conversion to 70cms for linking or repeater $375. John VK2ATU (02) 792 2275.

● YAESU FC700 antenna tuner $200; YAESU mobile whips $100. Peter VK2CIM QTHR (060) 25 1843

● COLLINS KWM-2 xcvr $800; S-LINE 75S-1/32S-1 $500; TNC-200 packet board $160, TELEREADER CWR-685A (updated software) $500; SONY ICF-2001 general coverage rx $200; OLIVETTI M24 computer $300. Tom VK2OE (046) 21 2228 evenings.

FOR SALE VIC

● YAESU FT101B vgc spare finals 2 mics h'books $450.00. Norm VK3DOL QTHR (03) 725 4061

● RACAL RA-17L receiver gc as new service manual $500; YAESU FRG-7 receiver as new service manual $300. G. Himolij, 118 Wilsons Rd, Newcomb, Vic 3219 (052) 48 1410.

● KENWOOD MC-50 $85, YAESU MH-10-E8 for FT290 MkII or FT211 $30; BENELEC ext speaker $15. All in exc cond Paul VK3EPD (059) 83 1771.

● REALISTIC HTX100 10m SSB/CW mobile radio excellent condition, still in box, plus ZCG mobile antenna $200. Derek VK3DD (03) 730 1557

● SATELLITE demodulator for Aussat TV RONEC 1022A requires simple audio board to be constructed to receive audio, circuit supplied plus LNC $105. N Muscat VK3BCU (03) 390 2609

● DECEASED ESTATE of VK2AHM KENWOOD TS930S HF xcvr excellent condition, KENWOOD TS820 HF xcvr; YAESU FL2100B linear amp; KENWOOD 2200G 2 mtr xcvr 1 watt 4 xtals, TH6DX needs reconditioning, 60ft telescopic lattice tower; EMOTATOR 1105MX rotator All mikes and manuals. Geoff VK3ACZ QTHR (050) 24 5987

FOR SALE QLD

● CREED Teleprinter model 54, original, complete with dialler/PSU and manua Best offer for this collector's item, SHURE model 450 desk microphone w/data sheet, v.g.c $90 or exchange ICOM SM8 desk mike ARA issue 1 of Vol 1 and many later issues, collector's items, best offer, ICOM IC-730 in g.c. $750; SIDEBAND SE-502 10M base station, with circuit diagram, conversion info and Xtals for reconversion to 11M $100. John VK4SZ QTHR (070) 61 3286.

● DECEASED ESTATE TH3 MK3 three element tribander 10m stee mast CDE rotator controller and transformer buyer to dismantle and remove; Offers please. ICOM 2A 2m with adaptor power supply TOKYO HYPOWER HL32V amplifier Graham VK4BGC (07) 359 0109.

● SIG GEN H.P good order covers 10 to 420 MHz $150, YAESU FTDX560 with manual $350. Good goer. Herb VK4KM (071) 64 2202.

● ICOM IC551 6m xcvr, s/n 01270, all mode inbuilt power supply, handbook, original packaging, mic, 13.8v cable for mobile use $225. Ian VK4KBC QTHR (071) 23 1224 or (071) 29 8237

● FT767 GX HF 6m, 2m, 70cm, vgc $2700, NATIONAL DR49 comms recvr good performer Ron VK4BL (070) 55 0230.

● TWO 55ft steel lattice masts complete with guys etc $250 each Buyer removes. Christine VK4CB QTHR (07) 202 6160.

FOR SALE SA

● TELEREADER CWR 670E with 11" green display tube Sanyo s/n 521168 $250. John VK5XT QTHR (085) 56 5881 after 1600 hours.

● KENWOOD TS430S HF xcvr s/n 3040447 c/w hand mike instr manua original packing, FM board fitted and mobile mount $900 Jeff VK5BJF QTHR (088) 42 2085.

FOR SALE WA

● KENWOOD 940S mint s/n 5110458 $1990, ICOM 725 mint s/n 0011794 warranty $990, ICOM 751A mint s/n 04493 $1380, XYL wants new kitchen! Graham VK6RO QTHR (09) 451 3561

FOR SALE TAS

● ALINCO 2M HH xcvr DJ-FIT/E s/n 4148, new and hardly used, in original box with instruction manual and cct diagram, paid $430 asking $325 ONO. Frank VK7LO (004) 24 6672.

WANTED ACT

● XFMR HV 1.5kv @ 500MA also LV xfmr 300-350v @ 200MA and or 6.3v @ 2.5A. Ted VK1BL (06) 257 6098 (AH).

WANTED NSW

● EARLY RAF and RAAF air publications and manuals for research project. Don't throw out those old publications! Dig them out now before its too late. Brad Latta, 6/2A Belmont Ave, Wollstonecraft NSW 2065, (02) 250 7468 BH, (02) 438 1985 AH. I will pay your postage.

● ONE SATO 70mm vernier drive second hand or new will pay good price. Graham VK2FA QTHR (049) 54 8688 AH or (049) 61 7236 Phone or Fax.

● 20M Beam. Peter VK2CIM QTHR (060) 25 1843.

WANTED

● ROBOT 400 memory chips, need at least four UPD411D 4k ram chips or substitutes to get my old robot working again. Can anyone help? Brian VK4BCF QTHR (07) 366 4578.

● PHOTOSTAT copy of operating instructions for telereader model CWR 685A. Please state costs. Gordon VK4KAL QTHR (079) 85 4168 prefer 6-8pm.

● ICOM-SM5 in v.g.c. or SM8 desk mike, FL30, FL45 Filters. John VK4SZ QTHR (070) 61 3286.

● THE HERVEY Bay Amateur Radio Club Inc. are looking to purchase a reasonably price Hf antenna either a TH3 mark III or a TH6DX and an Hf amplifier. Both must be in top working condition as it is for the club station. Gray Taylor VK4OH, PO Box 526, Hervey Bay Qld, (071) 25 7167.

● SERVICE manuals (or copies) for Eddystone Rx models 770R and 770U; ROLA tape to tape recorders models 66 MKI and 77 MKIII; REDIFON RX model 145/SSB all costs reimbursed. Christine VK4CB QTHR (07) 202 6160.

WANTED WA

● INTRUDER WATCH observers in VK6. Please help, free postage, logs, envelopes, advice. Our Division supports intruder watch. Please support us. Thank you. Graham VK6RO Co-ordinator for WA QTHR (09) 451 3561.

WANTED TAS

● PAN adaptor circuit for Kenwood TS 930 Mark 2; EK-101 electronic keyer will not work over 22 wpm. CAN ANYONE ADVISE ME HOW TO ADJUST THE 6 adjustment points. Gerry Visser VK7DQ, 10 Maranda Rd, Kingston Tas 7050.

MISCELLANEOUS

● DX-ERS Special Issue QSLs and Commemorative QSLs needed for WIA QSL collection, but all your cards are welcome. Can you help? Contact Ken VK3TL, 4 Sunrise Hill Rd, Montrose Vic 3765 or (03) 728 5350.

ar

Hamads

Please Note: If you are advertising items For Sale and Wanted please use a separate form for each. Include all details; eg Name, Address, Telephone Number (and STD code), on both forms. Please print copy for your Hamad as clearly as possible.
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ADVERTISERS INDEX OCTOBER 1993

HOW TO JOIN THE WIA

Fill out the following form and send to:

The Membership Secretary
Wireless Institute of Australia
PO Box 300
Caulfield South, Vic 3162

I wish to obtain further information about the WIA.

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VK4WCH Wednesday at 1000 UTC on 3535 kHz

VK4AV Thursday at 0930 UTC on 3535 kHz

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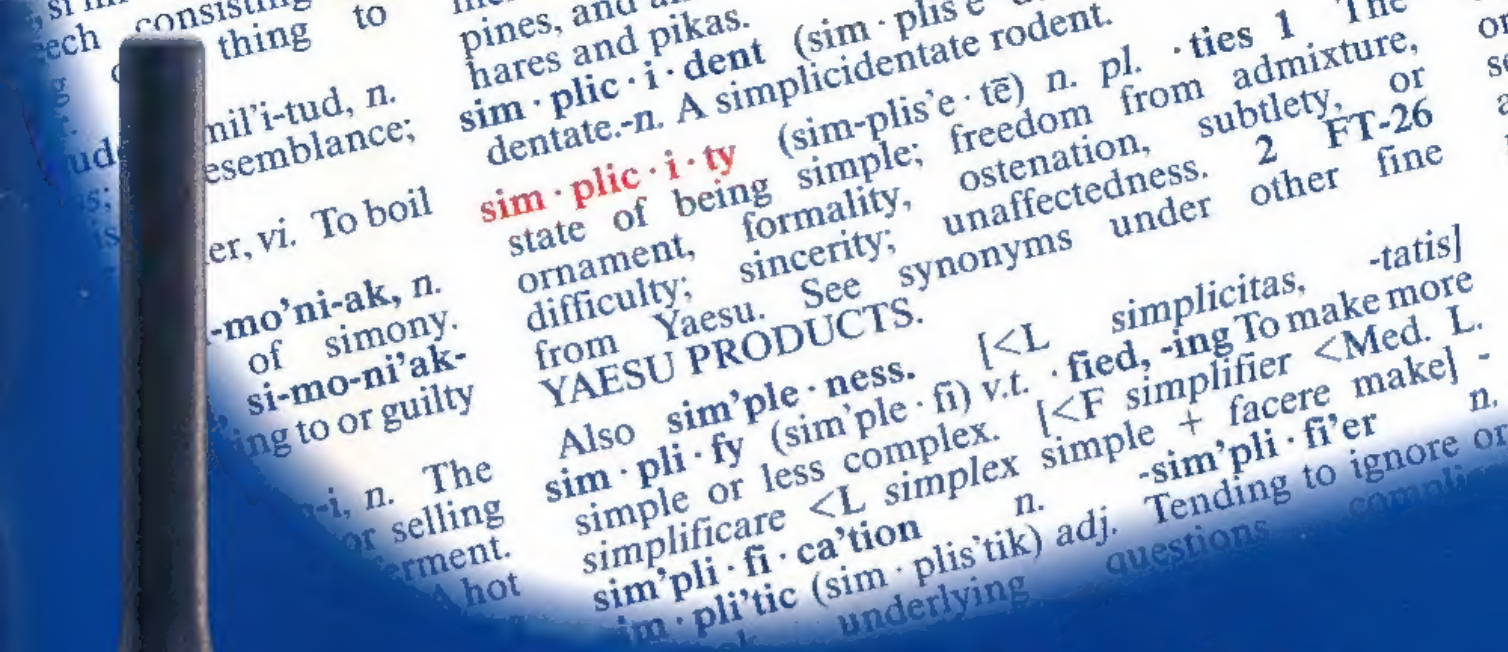

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